

American Gas *Association* MONTHLY

The Gas Industry's War Year

•

Manpower Pool Set Up for War

•

Using Gasoline for Gas-Making

•

Accident Prevention Program

•

Technicians Organize for War

January



1943

VOLUME XXV NUMBER 1

....."I helped cook 'em in my kitchen!"

"This is more of a woman's war than any war that has ever been fought!

"From the heroic nurses of Bataan . . . to the women at home faced with the problem of preparing nutritious wartime meals for their families . . . we're all playing a vital part in helping to win this war.

"But there's another way we can show our patriotism that many of us have probably never considered . . . and that is by avoiding wasteful use of Gas . . . in cooking and especially in house heating and water heating.

"Most people think of Gas only as a household fuel . . . the truth is, it's also used in making nearly every kind of fighting weapon that goes to our men . . . planes, ships, tanks, guns, bombs!"

"Gas makes them faster . . . and that means lives saved! It's much more economical . . . and that affects all our pocket-books. It's easier to control . . . and that means finer planes, better equipment for our husbands and sons!"

MEETING WARTIME NEEDS

1. For Gas fuel. Today the Gas industry is producing more Gas than at any time in history. Yet because of the difficulty in transporting fuel oil and coal to make manufactured Gas—and because of the shortage of materials with which to enlarge plants or build new natural gas pipe lines—there may be times in some sections when the demands of war production will reduce the amount of Gas normally available for household use. It is for these reasons you are urged to use Gas wisely—don't waste it!

2. For nutrition information. If you are one of the 85 million who depend on Gas for cooking, feel free to ask your Gas Company for the latest information on preparing nutritious wartime meals.

AMERICAN GAS ASSOCIATION



GAS

*is vital to war production
... use it wisely!*



 Buy War Bonds today—save for the Certified Performance Gas range of tomorrow.



CONTENTS FOR JANUARY 1943



A year of war has telescoped many changes into a very short period but on the whole the gas industry has stood the test in a heartening manner. It has rallied its total resources behind the war effort and has made many vital contributions. . . . President Bridge's review of the year presents a record of which the industry may be proud and which bespeaks even greater exertion in the fateful year ahead. The structure of wartime operation, after a few false starts, has been welded into a semblance of permanence. It calls for doing more and more with less and less. It calls for changes in operating procedure and in the labor pattern. But it holds nothing of which the industry need fear—for the way of war is not the way of peace and the fighting forces get first call on all men and materials. . . . Of special interest in this issue is R. J. Horn's splendid report on tests of the use of gasoline for gas-making. With a switch from heavy to light oil already in the cards, this contribution is significant and timely. . . . We thank our 1942 contributors and wish them and you a happy 1943.

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Symbol of progress in the gas industry, this striking picture of B. C. Miller closing a scrubber at the United Gas Pipe Line Company's Koran gasoline plant was taken by William J. Viers. It is another winner in the A. G. A. MONTHLY frontispiece contest.



JAMES M. BEALL, *Editor*

WAR YEAR

... Sees Momentous Developments in Gas Industry

ACTUATED by one primary motive—the strengthening and furthering of the nation's war effort—the gas industry in 1942 exerted every effort to increase America's war-time productive capacity to its maximum.

The outstanding development of the year was the mounting demands of war industries for gas fuel, approximately 25% of the present deliveries of natural gas and 15% of manufactured gas being used by war industries at the year end.

As a result of this accelerated use of gas in the fabrication of the implements of war, particularly the making of precision parts for guns, tanks, planes, ships, shells, etc., it became necessary during the latter part of the year for the War Production Board to issue orders limiting certain uses of natural and manufactured gas. Both orders prohibited new gasheating installations in certain critical areas and provided for steps to be taken to curtail gas consumption in time of threatened shortages. Later the above orders were revised and tightened.

Issuance of these Limitation Orders by WPB was made necessary by the fact that gas companies were unable to obtain steel and other critical materials to expand present capacities to meet greatly increased demands for gas fuel. Other reasons for issuing the orders, as stated by WPB, were to alleviate the oil shortage and lighten transportation load.

Prior to the issuance of these orders, the American Gas Association, through its Committee on War Activities and Committee on Publicity & Advertising, had conferred frequently with WPB. An appeal to consumers to economize in the use of gas in order to save critical fuels and transportation and help avert gas shortages was made by WPB October 28. On November 16 the Association announced its support of WPB's gas conservation program and at the

By **ARTHUR F. BRIDGE**
President, American Gas Association

same time released to gas companies throughout the country a public educational campaign covering the conservation and curtailment of gas fuel. The keynote of this campaign was "Gas is a vital war material. Use it wisely." The gas industry's national advertising program also emphasized the need of conservation.

At the end of 1942, 19,249,000 customers, or the largest number ever connected to the mains of the industry, were being served with gas. This was an increase of 627,000 over the year 1941. Of this total, manufactured gas companies served 10,733,000 customers and the remaining 8,516,000 customers were served by natural gas companies.

Revenues of the entire industry, both manufactured and natural, aggregated \$995,045,000, a gain of 8.9 per cent over 1941. Natural gas companies grossed \$584,533,000, a gain of 11.2 per cent, while manufactured gas companies were \$410,512,000, or 5.7 per cent more than for 1941.

Industrial sales of natural gas registered an increase of 58,911,000,000 cubic feet at the end of 1942, bringing the total sales to 908,476,000,000 cubic feet. This was a percentage increase of 6.9. Sales of manufactured gas for industrial purposes were 93,275,000,000 cubic feet in 1942, or 17.5 per cent more than for the previous year.

In the household uses of gas, such as cooking, refrigeration, house heating, water heating, etc., manufactured gas companies sold 283,900,000,000 cubic feet, a gain of 6.7 per cent for the year. Gas consumed for house heating registered an increase of 17.3 per cent. Sales of natural gas for domestic uses registered an increase of 13.3 per cent—bringing the sale for that purpose to 479,274,000,000 cubic feet.

Indications are that the total production of natural gas in 1942, including amounts used in the manufacture of carbon black and for field purposes, will reach a total in excess of

three trillion cubic feet. Some 232 billion cubic feet of natural gas were used as fuel for generating electric power in 1942, an increase of 29 billion cubic feet over 1941. In several instances, the above figures established new records.

Prompt action by the gas industry on matters originating with Government war agencies has been cleared through the Committee on War Activities of the American Gas Association. Activities coordinated and directed by this Committee, which is broadly representative of the natural and manufactured gas industries, have included salvage and the exchange of large quantities of materials and equipment by gas companies, the conservation of oil and tin, the preparation of handbooks on the protection of the gas industry, a study of the manpower situation, and various other emergency matters arising out of the war.

It is estimated that 55 per cent of the nation's productive capacity is being devoted to the prosecution of the war. In the all important metals field, where industrial gas is so extensively used, it is much greater. The transformation to a war-time basis has been accomplished in such manner as to cause no bottlenecks. In fact, all industry has experienced the quick conversion of industrial gas equipment. Too, new equipment has been available—thus facilitating new production peaks. The quality of American made implements of war has been acclaimed by all of the United Nations. Most war machines have hundreds of parts—each must be perfectly formed and of maximum strength. It is in the manufacture of these high quality parts that industrial gas is making its greatest contribution to the war production effort. The manufacture of high quality, interchangeable parts is the founda-

tion of mass production, modern gas furnaces for forging, hardening, annealing, and other heat treatments make it possible to deliver such parts at ever increasing rates.

While many gas furnaces of special design are being installed to take care of unusual production problems, it is a significant fact that by far the greatest amount of production from gas equipment is in furnaces the designs of which were thoroughly tested out before the war started. This has been one of the chief reasons why deliveries of new industrial gas equipment have not been unduly delayed—why there have been no bottlenecks. On the other hand, where special designs of gas heating equipment have been deemed advisable and desirable, the industry has drawn on its store of research and engineering knowledge and quickly produced suitable, automatic, heat treating machines that fit perfectly into the exacting requirements and are speeding the tempo of our vast war production plants.

MANUFACTURED GAS INDUSTRY*

	1942	1941	Per Cent Change
CUSTOMERS			
Domestic	9,842,000	9,617,000	+ 2.3
House Heating	434,000	365,000	+18.9
Commercial	414,000	417,000	- 0.7
Industrial	34,000	35,000	+ 3.0
Miscellaneous	9,000	9,000	—
Total	10,733,000	10,441,000	+ 2.8
GAS SALES (MCF)			
Domestic	205,066,000	198,900,000	+ 3.1
House Heating	78,834,000	67,207,000	+17.3
Commercial	60,006,000	57,698,000	+ 4.0
Industrial	93,275,000	79,352,000	+17.5
Miscellaneous	3,556,000	2,678,000	—
Total	440,737,000	405,835,000	+ 8.6
REVENUE (Dollars)			
Domestic	\$267,138,000	\$259,862,000	+ 2.8
House Heating	50,804,000	43,459,000	+16.9
Commercial	51,126,000	49,637,000	+ 3.0
Industrial	39,404,000	33,786,000	+16.6
Miscellaneous	2,040,000	1,631,000	—
Total	\$410,512,000	\$388,375,000	+ 5.7

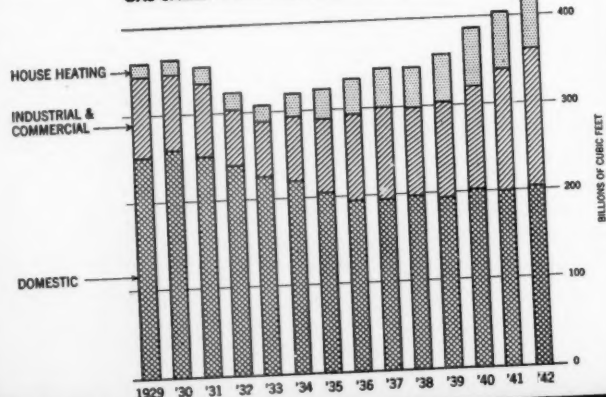
* Preliminary estimates.

Dehydrated Food Increase

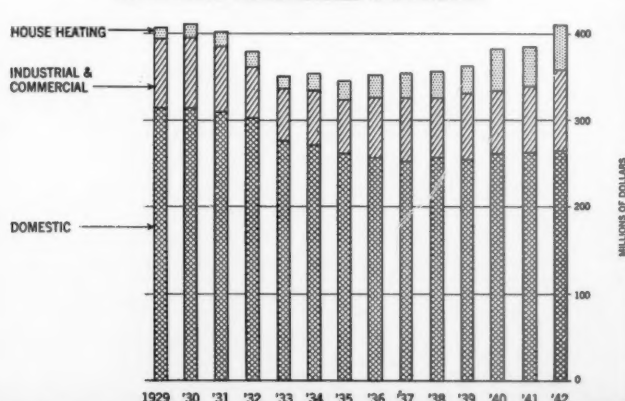
It is evident that more and more emphasis will be placed on dehydrated food to supply our over-seas forces and lend-lease requirements. The clean, controllable qualities of gas are recognized by this expanding industry as highly desirable. During the important steps of storing and packaging dehydrated vegetables, fruits, and other foods, a development of the gas industry is being put to ever increasing use. This development, dehydrated air, protects the processed foods until they are permanently packed for shipment.

Toast affords an interesting sidelight on the feeding of men and wo-

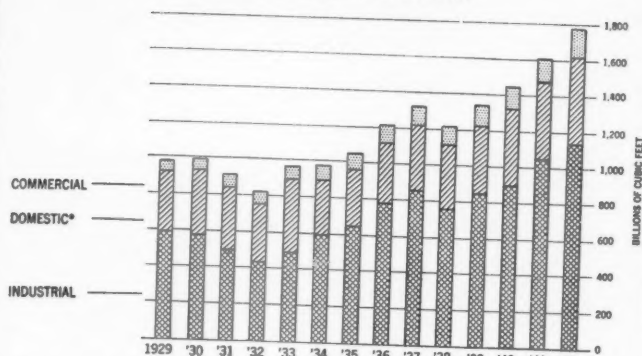
GAS SALES - MANUFACTURED GAS INDUSTRY



GAS REVENUE - MANUFACTURED GAS INDUSTRY

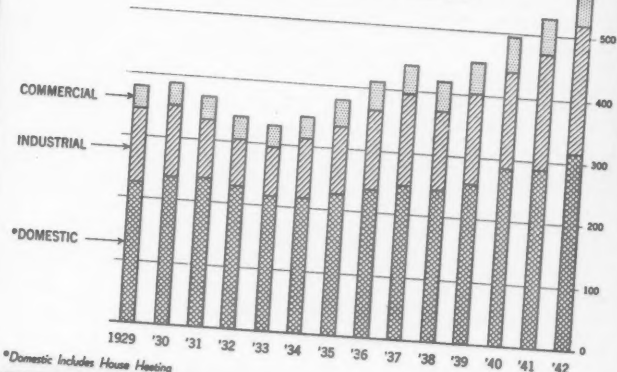


GAS SALES - NATURAL GAS INDUSTRY



*Domestic Includes House Heating

GAS REVENUE - NATURAL GAS INDUSTRY



*Domestic Includes House Heating

men in this war. It is believed that ours is the first army to enjoy toasted bread as a regular menu item in all establishments except in the field. The familiar gas revolving toaster, seen in so many restaurants and lunch rooms, has gone to war, and is daily doing its share to maintain the strength of those men flying the planes and shouldering the guns.

Other specialized cooking appliances that have been developed within the gas industry during peace time are also hard at work preparing tasty food for the Army and Navy forces. For instance, gas-fired deep fat fryers are being used by the thousands. They are particularly popular with army cooks in preparing French fried potatoes, the kind most in demand by both sexes in the armed services.

Continuing the trend which began considerably more than a year ago, activities of the American Gas Associa-

NATURAL GAS INDUSTRY*			
	1942	1941	Per Cent Change
CUSTOMERS			
Domestic (Incl. House Heating) .	7,870,000	7,554,000	+ 4.2
Commercial	595,000	578,000	+ 2.9
Industrial	51,000	49,000	+ 4.1
Total	8,516,000	8,181,000	+ 4.1
GAS SALES (MCF)			
Domestic (Incl. House Heating) .	479,274,000	423,013,000	+13.3
Commercial	153,226,000	130,405,000	+17.5
Industrial	908,476,000	849,565,000	+ 6.9
Electric Generation	252,018,000	202,990,000	+14.3
Total Industrial & Elec. Gen.	1,140,494,000	1,052,555,000	+ 8.4
Total	1,772,994,000	1,605,973,000	+10.4
REVENUE (Dollars)			
Domestic (Incl. House Heating) .	\$316,458,000	\$284,329,000	+11.3
Commercial	64,706,000	57,980,000	+11.6
Industrial & Electric Gen.	203,369,000	183,350,000	+10.9
Total	\$584,533,000	\$525,659,000	+11.2

* Preliminary estimates.

tion Testing Laboratories have been directed more and more to the demands of all-out war. After numerous preliminary contacts several assignments of a highly confidential nature were obtained from various branches of the

armed forces. To properly handle them the War Products Department of the Testing Laboratories was established. A very substantial portion of the Laboratories equipment and staff is now devoted to essential war activities.

Close cooperation with the Office of the Petroleum Coordinator for War by natural gas companies brought about many developments during the year. Among the more outstanding were (1) the relaxing of restrictions to permit further drilling of wells in the Appalachian region, eastern Kansas, portions of Oklahoma and Missouri, thereby considerably relieving gas shortages in those areas; (2) use of the Playa del Rey oil field, near Los Angeles, as a reservoir to store 2 billion cubic feet of natural gas to be available during peak periods; (3) a thorough study of hydrocarbons and an increase in their production for use in 100-oc-

COMBINED GAS INDUSTRY*

	1942	1941	Per Cent Change
CUSTOMERS			
Domestic (Incl. House Heating) .	18,146,000	17,536,000	+ 3.5
Commercial	1,009,000	995,000	+ 1.4
Industrial	94,000	91,000	+ 3.3
Total	19,249,000	18,622,000	+ 3.4
GAS SALES (MCF)			
Domestic (Incl. House Heating) .	763,174,000	689,120,000	+10.7
Commercial	213,232,000	188,103,000	+13.4
Industrial	1,237,325,000	1,134,585,000	+ 9.1
Total	2,213,731,000	2,011,808,000	+10.0
REVENUE (Dollars)			
Domestic (Incl. House Heating) .	\$634,400,000	\$587,650,000	+ 8.0
Commercial	115,832,000	107,617,000	+ 7.6
Industrial	244,813,000	218,767,000	+11.9
Total	\$995,045,000	\$914,034,000	+ 8.9

* Preliminary estimates.

tane gasoline, synthetic rubber and other war products, with a minimum use of critical materials.

Home economics departments of gas companies throughout the nation were the first to support the government's national nutrition program. These departments have afforded full cooperation to such community organizations as the Red Cross, Civilian Defense groups and nutrition committees. Such organizations look to gas company home economics departments for reliable instruction and leadership, and as a headquarters for meetings and demonstrations. Their programs also have dealt with the care and use of gas equipment, and in the future will include conservation and food rationing.

Gas leads the domestic field for cooking purposes. This is revealed in a recently published analysis of the 1940 Census which discloses that 73% of the country's 20,291,512 occupied homes in urban territories reporting a cooking fuel utilized gas for cooking.

Wood, coal or coke, kerosene or gasoline, and not electricity represent the major potential markets for gas, the survey reveals. A total of 4,431,-

620 or 21.8%, of homes in urban territory report the use of one of these fuels for cooking purposes. Thus there is a large unsold and lucrative market for the sale of gas cooking services.

That this market is being sold, and the use of gas for cooking is rapidly increasing in new homes built since the completion of the census, is clearly shown in the results of the American Gas Association's latest survey of new homes covering one- and two-family houses other than government projects built during 1941. Some 90% of these new homes use gas for cooking. The survey covered one out of every three homes constructed in 1941.

Gas for house heating ranks second (coal and coke combined rank first) among the nation's fuels as the census further discloses that 3,122,577 homes in urban territories reported the use of gas for heating purposes as against 2,260,566 using oil. The American Gas Association's study further indicates that 59% of the new homes constructed in 1941, covered in the above mentioned survey, report the choice of gas for house heating.

Gas is also a preferred fuel in the

defense housing projects sponsored by the various governmental agencies. A recapitulation of 325 such projects constructed as of December 1, 1942, shows that gas is used by 85% for cooking, 81% for water heating and 36% for space heating.

Appointment by the Association of a Committee on Post-War Planning recognizes the vital necessity for preparing now to meet the stepped-up competition immediately following the cessation of hostilities and to prepare for the inevitable dislocation of industry. A survey of gas company opinion shows that a majority of companies feel that if they render efficient and satisfactory service now their customers will become boosters of gas fuel in the post-war period.

A survey conducted during the year brought out the fact that gas companies were in favor of having the American Gas Association coordinate and supervise the research work of the gas industry. Among the branches of the industry specifically named to conduct research projects were the American Gas Association Testing Laboratories, the Institute of Gas Technology, the utilities and the gas appliance manufacturers.

Light Oil Substitution Expected

As this issue of the A. G. A. MONTHLY goes to press (December 22) an order is expected daily from the Office of Petroleum Administration for War requiring the 100% substitution of light oil for heavy oil in the manufacture of carburetted water gas in Coordination District No. 1, i.e., the Eastern seaboard area. This order, which would prohibit oil companies from delivering heavy oil to gas companies in that area, is expected to be effective not earlier than January 20, 1943.

The purpose of the order is to alleviate the heavy oil shortage in the East. The question of compensation for the additional cost of using light oil is under discussion by the A. G. A. Committee on War Activities with the Office of Price Administration.

Ernest R. Acker, of Poughkeepsie, N. Y., chairman of the Committee on War Activities, with other representatives of companies producing water gas, conferred on December 21 in Washington with officials of the Petroleum Administration for War and the War Production Board. Data furnished to and collated by the American Gas Association was submitted for consideration in the discussions.

The order, it is understood, will include provision for exemptions in cases of individual companies which will, in the meantime, have the opportunity to study their new problems of production, coke utilization and output.

Steps to Conserve Gas in New York

AFTER a record-breaking cold spell in the latter part of December hotels, restaurants and other wholesale gas consumers in the New York metropolitan area took steps to conserve gas and forestall possible curtailment of service as a result of the fuel oil shortage.

The Hotel Pennsylvania expected to reduce gas consumption by 35% by putting three of the hotel's four kitchens out of service between meals. At the Hotel Astor daily meter readings were being made and if the reduction was not satisfactory, several kitchen units were to be cut off entirely.

A typical case in the restaurant field was that of Stewart's cafeterias, where management-labor conservation committees have been named in each of sixteen units operating. After the rush hours were over, Stewart's cut out half of their steam tables, and only half of the ovens of their kitchen ranges were to be used. Kitchen attendants were told to watch pots in which food was cooking so that the gas jets could be turned down as soon as the food came to a boil.

Post-War Planning . . . Gas Industry Launches Far-Reaching Preparedness Program



A. M. Beebee

EXACTLY one year after Pearl Harbor, on December 7, the gas industry which is now doing its utmost to help achieve victory, launched a far-reaching endeavor to deal intelligently and with forethought with the tremendous effects of America's participation in the global war. On that date, the newly formed Post-War Planning Committee of the American Gas Association held its organization meeting in New York and mapped out a four-pronged program to crystallize and put into action a far-sighted preparedness platform for the gas industry.

Need for Undertaking

As chairman of this important activity, Alexander M. Beebee, general superintendent of the gas department, Rochester Gas & Electric Corp., Rochester, N. Y., outlined the objectives of the committee, and emphasized that while the paramount immediate objective of every American is to win the war, it is also imperative that a small group should study post-war conditions so that the industrial progress of the nation and the gas industry will not falter in peacetime. He pointed out that to meet the new conditions arising out of the war, an increasing number of organizations, government agencies and trade associations have started post-war planning activities during recent months.

Membership of the Post-War Planning Committee includes representatives from every branch of the industry to provide the broad viewpoint and facilities necessary to carry out the studies to be made. These studies will be divided into four major divisions

with the scope and under individual leadership as follows:

1. *Post-War Purchasing Power and Potential Available Markets.* C. V. Sorenson, supervisor, new business, Midland Utilities Co., Hammond, Indiana, *chairman.*

This phase of the work will endeavor to determine the potential post-war markets of the industry (ignoring competitive conditions) as they will be influenced by probable income levels, customer preferences, prevailing condition of the consumer markets, character of future home construction, and other factors.

2. *Probable Competitive Conditions in the Post-War Period.* R. J. Rutherford, vice-president, Worcester Gas Light Co., Worcester, Mass., *chairman.*

This study will aim to evaluate the scope and intensity of competition to be expected from competitive services and products from the viewpoint of post-war productive capacity of competing industries compared with ours, changes in basic energy supplies and markets, and effective plans for meeting this competition.

3. *Engineering and Economic Problem Within the Gas Industry.* Hall M. Henry, Negea Service Corp., Cambridge, Mass., *chairman.*

This approach will include the investigation of the possibilities of producing and distributing gas more efficiently and economically, a study of the improvements needed in our own utilization equipment in the opinion of the industry and its customers, the economics of the gas house heating load today, the possibility of profitably liberalizing our extension policies, and other related factors.

4. *General Economic Developments That Will Influence Our Markets.* Walter C. Beckjord, vice-president and general manager, Columbia Gas and Electric Corp., New York, N. Y., *chairman.*

The approach here will include a study of post-war plans of the government and other public agencies, an up-to-date picture of the gas industry in relation to the operations and plans of other major industries, and other major economic developments.

As pointed out by Mr. Beebee, it is obvious that many of the questions in the gas industry planning program must be studied on an individual company basis before overall conclusions

can be drawn for the industry. Consequently, the first recommendation of the committee is to urge that each member company designate one or more qualified members of its personnel to study and analyze such questions from the standpoint of the company's operating conditions in cooperation with the Association's Post-War Planning Committee. The committee will suggest lines of study and may request information from time to time as its program develops.

Mr. Beebee stated that the committee undertakes the responsibility of doing that part of the work which must be done on a collective basis by the industry as a whole, and of making this information available in a series of bulletins to the representative of each company as an aid to his activities.

Discussion at the meeting brought out the fact that this so-called "Baruch Committee of the Gas Industry," will encompass technical, marketing and merchandising fields. It was agreed that under the pressure of a great war there will be compressed scientific, economic and social developments that might take decades to achieve under less urgent conditions, and that it is vitally necessary for the gas industry to be ready to cope with these problems. The need for post-war planning was emphasized recently by Charles E. Wilson, WPB production chief, when he said: "The vast forces unleashed by the war program . . . have served to underline the urgent necessity of facing the problems of peace some time in advance of the victory."

WOMEN IN GAS WORKS

In England women are now being employed in the gas works—operating water gas plants, attending to coke, preparing oxide for purifiers, working as engine house attendants and cleaning waste heat tubes. In the field, they are reading meters, collecting from cash slots, and doing many other jobs.

Manpower Pool . . . Established by Gas Utility To Meet Wartime Emergencies

"Emergency" is a common word in the vocabulary of the operating man. He has always had to plan a marginal factor of safety for the unforeseen. Now, with wartime drains upon manpower, it is becoming increasingly difficult to allow leeway for normal contingencies, let alone for the added threat of war emergencies. By a relatively simple expedient, this company has been able to increase available distribution manpower by some thirty per cent. An explanation of how this was accomplished should prove beneficial to other companies.



R. B. Barger

THE operating men in Hartford are what you might call "catastrophe minded." Within the past few years we have experienced three disasters—two major floods and one full-fledged hurricane. Outlying district outages occurred in each case, and the bottleneck in getting back to normal was manpower.

With the present added threat of enemy bombing, sabotage and fuel shortages, our President, N. B. Bertollette, suggested that we establish a reserve pool of operating manpower by training the male personnel of the non-operating divisions of the company in basic theories and procedures. By doing this we would have instantly available, competent personnel which would be sorely needed in restoring and maintaining gas service throughout our territory in the event of any catastrophe. On such occasions in the past we have held emergency training classes for these men on very specialized phases, with a consequent loss of valuable man-hours and a lack of a rounded understanding of our operations on their part.

Accordingly, the eligible male mem-

By R. B. BARGER

*Superintendent of Service Operations
The Hartford Gas Company,
Hartford, Conn.*

bers of the Accounting and Sales Departments were canvassed, with an excellent response, including the divisional and department heads. Surprisingly enough, four women expressed interest and we were very pleased to include them as it was felt that, with sufficient background, they could intelligently replace male dispatchers and release them for field work during an emergency. The total registration was thirty-five, representing about thirty-five per cent of our total non-operating personnel.

The writer was appointed chairman of a special training committee which consisted of heads of the Operating, Sales and Accounting Departments. Realizing that this reserve manpower in all likelihood would be called upon to do turn-off and turn-on work, the committee drew up an instruction outline that stressed the knowledge needed for this type of work. Included also was enough material on the basic theories and procedures of manufacture and distribution to assure the students an overall working knowledge of our operations. The course material was broken into six major headings—Manufacture, Distribution, Utilization, Turning On and

Off Meters, Lighting Appliances, and District Outages. Each topic covered one class room session, with actual physical practice following the meter and appliance sessions.

Department heads were called upon to present the material covered by their activities. In this manner we had several qualified personalities before the students. Mr. Bertollette opened the course with an explanation of its purpose, and Paul R. Buchanan, our vice-president and manager of operations, presented the material for the first session.

Each student at the first class was presented with the following topical course outline, which roughly gives its scope:

Class I

Manufacture. Explanation of what gas is—how it is generally made—coke-oven (coal) gas—carburetted water gas—heating value—specific gravity—how it burns. An outline of our particular hook-up. (We get our base gas from a coke oven plant some 40 miles away, supplement it with a carburetted water gas stand-by plant at Hartford.)

Class II

Distribution. Pressure maintenance—holders—pumping stations—mains—district and house regulators—drips—services—shut-offs—stand pipes—meter bars—maintenance routines for mains and services—extension and new service routines. *Meters.* Principle of operation—how made—why usually tin—maintenance of meters—other types.

Class III

Utilization. The atmospheric gas burner—inputs, pressures and spuds—combustion—air needed—primary—secondary—yellow flame burners—flues—gas and pilot cocks—safety pilots—thermostats—governors.

Class IV

Turning On and Off. Theories—our procedures (Demonstration unit on platform)—hazards—leaks—air in lines—removing meters—resetting meters—locking and sealing devices—tools needed—orders and records. Actual physical practice in all steps for each individual.

Class V

Lighting Appliances. Gassing out appliances and lines—air in lines—effect on burners and pilots. Ranges—burners—pilots—safety pilots—thermostats—stand-by pilot and low flame adjustments. Refrigerators. Water Heaters—water in heater—pilots—burners—thermostats. Space Heaters—water in boiler and system—pilots—burners—switches—thermostats. Actual physical practice on all basic types of appliances for each individual. Display and explanation of various fundamental types of controls and safety elements.

Class VI

District Outages. Past experiences—1936 Flood—1938 Flood and Hurricane—procedures—mass turn-offs—purging mains—mass turn-ons—customers not home—notice, forms, tags—publicity—hazards—organization—co-ordination of divisions and squads—tools—reports and records. Summary and general questions from students. End of course.

Classes were scheduled for Monday and Tuesday mornings of successive weeks until the course was completed. In order to minimize conflicting activities and to encourage regular attendance throughout the course, classes were held during the hour preceding our regular office starting time, from 7:30 to 8:30 in the morning. As a result, we had very few absentees and practically no late-comers. Employees with the exception of department heads were paid overtime compensation for the hours of class attendance.

The meetings were held in the basement auditorium of our Main Office in which building, most non-operating employees work. Many companies are fortunate, like ourselves, in having their Home Service Demonstration and Preparation Kitchens located at their Main Offices. This afforded an excellent locale for our classes, as there are

several types and models of gas appliances already connected for our use in demonstration and practice. The only exhibit that it was necessary to add was a meter set mounted on a panel, complete with basement service cock, high and low pressure appurtenances, meter and bar, seals and a house line connected to a CP gas range.

Although we maintained a strict record of attendance, no attempt was made to make the course formal. No written or oral quizzes were given, and the sessions were open to questions from the floor at any time. We believe that this informal atmosphere helped to maintain the initial enthusiasm which continued throughout the course. The intelligent questions and the interest shown during and after the classes evidenced a high absorption of the material offered.

There were no desks or convenient writing spaces available, so each student was furnished with a set of illustrated mimeographed notes on each subject. This worked out very well, as the students were able to give their undivided attention to the speaker and when the course was completed each was assured of a neat sixteen-page digest of the course for ready reference. In addition, these notes will be used as the basis of refresher courses, and might be given to new employees in any department to read over.

No attempt was made to offer any monetary or other reward for passing or excelling in the course. Those attending all of the sessions, or missing no more than one with good cause, were simply awarded mention as having successfully completed the course.

The most beneficial instruction technique employed was that of giving each student the opportunity to perform individually the meter functions of turning on and off and removing and resetting, and the lighting of several types of the four major appliances. It was physically impossible to offer this opportunity to everyone in the hourly morning sessions, so small groups of two or three employees at a time were called to the auditorium during the working day following the morning "lecture" session. A surprising sidelight to this activity was the adeptness shown by the women class members. Three of them demonstrated more aptitude in the handling of tools than many of the men attending. In a way, this opened our eyes to the "women in industry" angle.

The results of this course were most gratifying. As well as accomplishing its original purpose of developing a reserve manpower, it also brought us the many other benefits of employee training. These employees now have more interest in their job as it pertains to the company operations as a whole, and are better fitted to do their daily tasks. It has given a general background training to personnel who may have to be transferred to the operating division before this conflict is over. In addition to being prepared for the actual emergency when it occurs, they are now in a position to take operating division posts in our Air Raid Precaution organization.

The total cost to the company was about ten dollars per employee. We feel that it was a mighty good investment.

Group of gas company employees who have now completed training under the "labor pool" plan



War Contributions . . . of Natural Gas in the National Fuel Coordinating Program



E. Holley Poe

Six months ago I left the American Gas Association to take the position of Director of the Natural Gas and Natural Gasoline Division of the Office of Petroleum Coordinator for War, which is now the Petroleum Administration for War. When I came to Washington, I found that I was working with the same group of men that I had worked with in the Association. The respective district coordinating committees had been nominated by the industry and appointed by the Coordinator as outstanding men having a great background of experience in the natural gas business.

Our association for the past six months has been one of complete cooperation and coordination, working together in the endeavor to effect the maximum deliverability from the existing gas fields and a maximum of service to the many war plants, Army and Navy camps, and the civilian population. We start the New Year marching together toward even greater accomplishments in the war effort for 1943.

Personally, and on behalf of our entire staff, I want to express full appreciation for the splendid support the industry has given our office, and to urge that we continue in this understanding manner for the duration of the war.

NATURAL gas does a very big and important job. It touches practically every phase of the war production program. It is used to keep our fighting men warm, used in preparing their food, and for heating the water to keep them clean and healthy. It is used in hundreds of higher industrial processes all along the war production stream, and its components provide an important part of fighting fuel.

Since 1938 the use of natural gas for industrial and commercial purposes has increased by more than 10% per year. Indications are that this year will exceed last year by 25% and in some areas as much as 40%. Natural gas consumption in the United States for the year 1942 will probably approach 3 trillion cubic feet. It will exceed that in 1943. For the purpose of comprehension through comparison, it may be stated that 3 trillion cubic feet of 1000 B.T.U. natural gas is approximately equivalent in heat energy to 124 million tons of coal, 879 billion kilo-

By E. HOLLEY POE
*Director, Natural Gas and Natural Gasoline Division
Petroleum Administration for War
Washington, D. C.*

watt hours of electricity or 540 million barrels of fuel oil.

This tremendous volume of energy must be consumed largely within the nation and cannot be exported. Therefore, the greater market served by natural gas in the nation, the more oil there will be available for export to the fighting forces of the United Nations and for usage in markets not at this time served by this superb fuel.

The problems of the natural gas and natural gasoline industries are in large measure the same problems that are faced in the production, transportation, refining, distribution, and utilization of oil and its many by-products. As regards natural gas, it differs from oil only in that it is a well-to-burner operation. Therefore, reserves to balance

supply with demand must be developed and kept in formation in readiness for a rush call to meet high peak demands. With the exception of a few places where underground storage is maintained there is no major means of storing natural gas close to the great critical industrial centers in the nation today.

The problems resulting from the impact of war include:

1. Increased demands by both war industries and private industries as well as the normal increase of about 12% in normal civilian usage.
2. Lack of materials to expand facilities in keeping with these increasing demands.
3. Increasing shortage of manpower brought about by enlistments, induction into the Armed Forces and migration of workers to other war industries.
4. Increased expenses resulting from the rising cost of labor, materials, and operating supplies.
5. The heavy tax burden, present and prospective, in the view of expenditure of tremendous sums of money in order to supply demands of the war effort.
6. Ascertaining the expected requirements of natural gas, natural gasoline and related hydrocarbons by all phases of the war effort in time to provide for them.
7. The need for relief during the war period from express or implied covenants contained in leases by reason of limited supplies of critical materials which prevent the orderly drilling of wells on such leases.

The Appalachian Region or District One which includes such great industrial centers as Pittsburgh, Toledo, Cleveland, Columbus, Akron, Dayton, Charleston, and others contains about 6% of the proved natural gas reserves

of the nation, and the market served equals 18% of the nation's natural gas sales. M-68 was relaxed as respects the drilling of gas wells in this area. As a result of the recent drilling program in this region, it appears that there will be only a few areas within the region where actual shortages will appear on peak load days during the coming winter. With the drilling of less wells there has been developed a greater deliverability than during the previous year. In the very near future, however, if the war markets in this region are to be adequately served by natural gas, thus freeing oil for other uses, there is no doubt that there will be need for increased transportation facilities from the great reserves of the Southwest.

In District Two are located such large and important industrial centers as Detroit, Chicago, Minneapolis, St. Paul, Omaha, St. Louis, and Kansas City. For the most part, gas to supply

these large and important markets is transported through long trunk line systems originating in the reserve areas of the Texas Panhandle, Oklahoma Panhandle and Southwestern Kansas, or in the fields of Louisiana and Texas. Ability to supply the demands is limited only by the deliverability of existing pipe line systems.

As respects other markets not attached to these trunk line systems, the greater part of the gas produced and marketed is being produced from old fields that are now nearing depletion and from which gas is being taken during peak load at peak deliverability.

The Michigan gas supply is largely an intrastate situation, and while they have adequate supplies at the present time, their reserves are relatively small when compared with the markets served.

Illinois has practically no marketable gas. Oklahoma is producing almost en-

tirely from highly depleted pools. There are some new pools such as the Cement area and the deeper sands in the Chickasha area but the demands on these fields indicate that their depletion will be rather rapid. The old pools of Kansas appear to be from 50% to 80% depleted. In this area and in Western Missouri and Northeastern Oklahoma, the provisions of M-68 were relaxed to allow as great a development as possible to take care of the current winter's requirements.

There will be peak-day curtailment in many parts of this District and the shortage of fuel oil for standby service is becoming acute. Indications are that in this District, within the next 18 months, there will have to be some major pipe line construction if adequate supplies are to be maintained. In the meantime we are encouraging the exploration of new areas within a

(Continued on next page)

Our Industry's War Outlook



Burt R. Bay

INDICATIONS are that in the coming year the natural gas industry will find it more difficult to secure materials for new developments than at any time in its history. According to opin-

ions expressed in Washington it will be necessary, if essential expansion is to proceed, to effect a further consolidation and reconstruction of facilities wherever possible.

The victories in November which gave new hope to the United Nations mark the beginning of our most strenuous war period and our fighting forces are now approaching their maximum combative effort. From now on our war outlook will have to be more realistic and our sacrifices greater if we are to provide our army and navy forces with the increasing volumes of raw materials which they require. The com-

By BURT R. BAY

*Chairman, Natural Gas Section
American Gas Association*

ing year will be a crucial one and there is no one so well informed as to be able to predict the problems and sacrifices which will be encountered. We can see now that no industry and no company can expect to maintain a normal equilibrium of operations under such circumstances.

One of the first duties which presents itself to the natural gas industry, as well as to other industries, is to use to the maximum limit the inventories on hand and to utilize by reconstruction of facilities those materials not now being utilized to the maximum. Included in the program which will enable the industry to carry on during the war will be many substitutions of products and materials for those which were heretofore included in normal operations. The ability of industry to make these substitutions will be one measure by which its war effort will be appraised. The feeling in Washington

seems to be that American industry is fully aware of these realities and of the vital need for full cooperation in the joint solution of all problems.

The agencies affecting the natural gas industry show a desire to work out the necessary war program through cooperation with the industry rather than through the issuing of orders. At the same time certain limitation orders and directives are required and it is the firm attitude of these bodies that American industry must comply with them to the limit of its ability.

The natural gas industry, together with other industries, is faced with the greatest challenge it has faced in its eventful history—the challenge to follow through on its war responsibilities in the face of limitations and shortages. We in the industry should feel encouraged to carry on, knowing that in those agencies with which we deal, are men experienced in the natural gas industry who are devoting their energies to sincere cooperation with their industry and their government for the solution of common problems.

reasonable distance of main transmission lines where such lines will be able to transport additional gas to meet the peak loads.

The prospects for new discoveries of any new major gas reserves in this area do not, at this time, appear very encouraging. By reason of this overall condition in District Two, we have had to deal with a situation prevailing in the Hugoton Field located in Western Kansas and the Panhandle of Oklahoma. As you all know, this field constitutes about the largest single unified gas reserve in the world, and relatively little gas has been withdrawn from it to date. The occurrence of gas in this field is so uniform and regular that a producing well is almost certain to be encountered in any location in the field. Something over 300 wells have been drilled and there are about 28 to 30 wells that have been drilled but are not at this time connected to market outlets. The potential gas available from the wells already drilled is more than sufficient to supply the demands of all the pipe lines dependent upon the field for their supply. Notwithstanding this, drilling operations continued in the field. The recent supplement to Conservation Order M-68 has curtailed all further drilling operations in this field without the approval of the Office of Petroleum Coordinator for War.

Proration Program Essential

It is the consensus that in order to conserve critical materials as well as the gas reserves of the field, a proper proration program must be put into effect. The Natural Gas and Natural Gasoline Division has sponsored joint action by the State Regulatory Commissions of the States of Oklahoma and Kansas, looking toward a solution to this problem. These agencies are approaching an agreement on the form of a uniform proration order to be issued individually by them for the portions of the field in their respective states. The administration of the orders will be by the cooperative action of the two Commissions, and will have the effect of regulating operations in the field as a single unit. This will permit efficiency in the conservation of both critical materials and gas reserves

and will result in making use of most of the gas wells already in existence but not yet connected to markets.

As far as practicable, in encouraging such orders, we recognize that any attempted proration should be predicated on the most direct and least complicated approach, giving reasonable recognition to the correlative rights of the owners of reserves in place and least interference to the withdrawal of gas in keeping with varying seasonal needs.

South of Latitude 39, West of the Mississippi River, North of the Gulf of Mexico and Rio Grande River lies

Key Men in Natural Gas War Program

E. Holley Poe, Director, Natural Gas-Gasoline Division
Paul M. Raigorodsky, Assistant Director, Natural Gas-Gasoline Division
James E. Pew, Chief, Natural Gasoline Section
Charles E. Webber, Senior Analyst, Natural Gasoline Section
Robert W. Ducker, Chief, Natural Gas Section
Thomas R. Weymouth, Consultant, Natural Gas Section
Frank H. Dotterweich, Consultant, Natural Gas-Gasoline Division
Petroleum Administration for War, Room 7314, New Interior Building, Washington, D. C.

the nation's greatest fuel reserve. In the case of natural gas reserves it contains the equivalent of something over 70% of the total. In the case of production of natural gasoline and related hydrocarbons the percentage would be greater. It is one of the most important training areas for our Armed Forces in the country. It is likewise an area in which there is tremendous war industry activity. It is the region to which we must all look for the greatest source of supply for oil, natural gas and natural gasoline and related hydrocarbons because new discoveries of production in this area are generally more prolific than in other areas of the nation. It is the area in which the greatest encouragement for new exploration and development should prevail.

In this area there are large reserves of distillate and large concentrated gasoline plant capacity producing the

largest available supply of natural gasoline and related hydrocarbons which are so critical to the war needs.

The plants of this industry perform a great service in normal times in conserving what would largely be waste products of great value, and in this war period this service can become vital as they make up the deficiency of hydrocarbons at the plants of those refiners who are turning out necessary war materials.

District Four, comprising the Rocky Mountain States, is the least densely populated of any of the districts. It supports many industries vital to the war program. Large volumes of natural gas are used in the smelting and refining of non-ferrous metals, the production and refining of oil and the refining of beet sugar. Many new military establishments are also dependent upon gas for fuel. Except for gas from the Panhandle Field of Texas, transported for utilization in Colorado, the area is largely self-sustaining from the standpoint of natural gas supply.

Pacific Coast Problems

District Five, the Pacific Coastal area, being separated as it is from the remainder of the country by the Rocky Mountains, is entirely dependent on gas produced within the immediate environs. California, the only large producer of natural gas in the district, has the largest number of gas consumers of any state in the Union and is the only large producer of natural gas that does not export or import any of this natural fuel. Because California's natural gas production is predominantly casinghead gas, increased demands and scarcity of critical materials have resulted in unusual problems.

In order to conserve gas produced in association with oil in excess of summer demands and utilize it to meet peak demands during winter months, there was needed an adequate storage. As a result of cooperative study of the California Railroad Commission, local oil and gas operators, and the Office of Petroleum Coordinator, it was determined that the partially depleted Playa del Rey oil pool had characteristics suitable to use for gas storage.

Upon recommendation of the Office of Petroleum Coordinator, the Playa

(Continued on page 43)

HOME SERVICE HIGHLIGHTS



Display features of the Minneapolis Gas Light Company which were Nutrition Week bell-ringers. At left is a war worker's lunchbox display on the sales floor featuring a lighted counter demonstration and a group of lunchboxes in the background attached to white cards outlining nutritious lunchbox meals. Below is a window display which stopped passersby with an invitation to call for a recipe sheet, "Pack a Punch in Every Lunch," prepared by Jeannette Campbell, home service director. The five-column newspaper ad on the right told how Joe missed pay checks because of inadequate lunches



ANALOGOUS to the flexibility of gas as a fuel is the flexibility of the home service program of gas companies during wartime. Cooperation at all times with the government programs of nutrition, conservation and food rationing, has been the keynote of its war service contributions, as many articles in recent issues of the A. G. A. MONTHLY have pointed out. Illustrated

here is further evidence of this support in information from four utility companies which was received in response to the A. G. A. Home Service Committee's questionnaire.

Shown are (1) A nutrition center of the Iowa-Illinois Gas & Electric Company at Rock Island; (2) Window, store display and newspaper advertising of the Minneapolis Gas Light Company during Nutrition Week in Minneapolis; (3) A meat rationing information booklet prepared by the Wisconsin Public Service Corporation; and (4) A food, fuel and equipment conservation booklet of the Ohio Fuel Gas Company.

"War Ways," the pamphlet shown below, was prepared for The Ohio Fuel Gas Company, Columbus, by Hulda Ungericht, home service director, and J. E. Humphrey, advertising manager. It includes a detailed food guide, information on economies in purchasing and storage, as well as fuel and equipment conservation material. It is available to other gas companies at nominal cost



Above—Dale Remington, advertising manager, and Kathryn Heffernan, home service director, Wisconsin Public Service Corp., Green Bay, Wis., in this popular booklet, anticipated customer interest in meat rationing. It lists food values of meat alternates and extenders and includes many recipes for meat substitutes. Sample copies will be sent upon request to the company

Left—Mrs. Margaret Crooks, home service director, Iowa-Illinois Gas & Electric Co., Rock Island, Ill., in a nutrition center carrying a pictorial story of wartime hints

Frank D. Cadwallader Is Dead



F. D. Cadwallader

FRANK D. CADWALLADER, vice-president in charge of public relations for the Boston Consolidated Gas Company, died November 29 after an illness of three days.

Mr. Cadwallader was widely known and respected throughout the utility industry. He was an important figure in the gas industry's national advertising program, having served on the main American Gas Association advertising committee and as chairman of the copy committee.

He was born in Trenton, New Jersey, July 4, 1882. His first contacts with the utility business were in Lowell and Toronto. In 1912 he became New England representative of the Standard Gas Equipment Corporation of New York. In 1927 he joined Boston Consolidated Gas Company as vice-president in charge of sales and continued in that capacity until January 1, 1937 when he became vice-president in charge of public relations for the company.

He was the first treasurer of the New England Gas Association, elected in 1926 and served until 1941; treasurer of the Engineers' Club of Boston from October, 1928 to February, 1935. He is survived by his wife, Ellen R. (Ford) Cadwallader, and a son, Richard F., a Lieutenant (j.g.) in the United States Naval Reserve.

Back to Bicycles

THE Philadelphia Electric Co. is going back to the bicycle age. About 116 of the company's 866 motor vehicles have been stored, with tires removed, for use on a rainy day. The company will use bicycles to answer calls for gas and electrical service in the city. In some suburbs meters have been read every third month since Pearl Harbor and the bills for the other two months are estimated.

Books for Our Service Men

GAS companies and gas men have been asked to support and participate in the 1943 Victory Book Campaign to cooperate in the collection of books for men in our armed services. The campaign is being conducted by a national board with Franklin P. Adams, Edward L. Bernays and Norman Cousins acting as co-chairmen.

The second edition of the Victory Book Campaign will open on January 5 and end on March 5, 1943. Industrial, civic, educational, labor and community organiza-

tions are contributing this year, more than ever.

Husbands, fathers, sons, have forsaken their loved ones in defense of their country and its way of life and are battling today on fifteen fighting fronts. Next to cherished family letters, a good book, serves at a time of need, to entertain, refresh and stimulate.

The emphasis has been, and is today, on the very best books you can give. This means, first of all, the books must be in good physical condition, not the broken-down, dog-eared volumes accumulating dust and mould in the attic.

In addition to donating your own books, volunteers are needed to serve on collection committees, to cover each community with book deposit containers, to circulate poster, to chauffeur books from collection centers to the libraries, and to spread the message "Any Book You Really Want to Keep is a Good One to Give."

Gas companies are requested to post campaign notices on their bulletin boards and to urge their employees' cooperation in employee magazines and other publications.

Even Rationing Has Its Points

IT'S an ill wind that blows no good. Royal F. Munger writing in his column "Old Bill Suggests," in the November 24 Chicago *Daily News* points out the following silver lining in the gas rationing cloud:

"With the rationing of gas and oil heating bringing worries to housewives, people are beginning to realize how important a part gas plays in our modern civilization. The kitchen stove, the gas refrigerator, house heating, and a dozen industrial uses are commonplace. Yet gas was not only unknown, but even without a name until comparatively modern times.

"The Greeks thought 'air' was one of the fundamental elements, and when the medieval alchemists found substances giving off fumes or turning to vapor, they spoke of 'spiritus,' 'aura,' 'emanatio nubila' and similar terms. There was no convenient everyday expression except the obvious misnomer of 'smoke.'

"In the early 17th century, a Belgian nobleman, Jean B. Van Helmont, removed from trade by birth, and still further removed from ordinary toil by a rich wife, experimented with the properties of various substances. Groping in the same search for knowledge that was producing Harvey, Galileo and Bacon, he did some experiments with carbon dioxide.

"He knew it was not air, and being somewhat at a loss, referred to it in a book published posthumously in 1648 as 'gas.' (. . . 'hunc spiritum, incognitum hactenus, novo nomine gas voco.') He explained in his book that the term was suggested to

Ann Arbor Puts Over Nutrition Week

DURING October the city of Ann Arbor, Michigan, carried on a truly city-wide project to show the role of proper nutrition in the nation's war effort. Mrs. Ruth Bush, home service director of the Michigan Consolidated Gas Company at Ann Arbor, was chairman of the City Committee for Nutrition Week. Window exhibits along "Main Street" were made up of food displays, posters and illustrations, with much of the material prepared by classes in the city schools, the dietitians of the city hospitals, and students at the University of Michigan.

A Victory Luncheon held during the week was open to the public. At this luncheon the conservation committee of the Ann Arbor Garden Club displayed an effective exhibit of fruits and vegetables with directions for storing and other conservation methods. Assembly programs were given during the week at the local high schools, and in the junior high schools, skits were presented, and in the lower classes puppet shows were arranged.

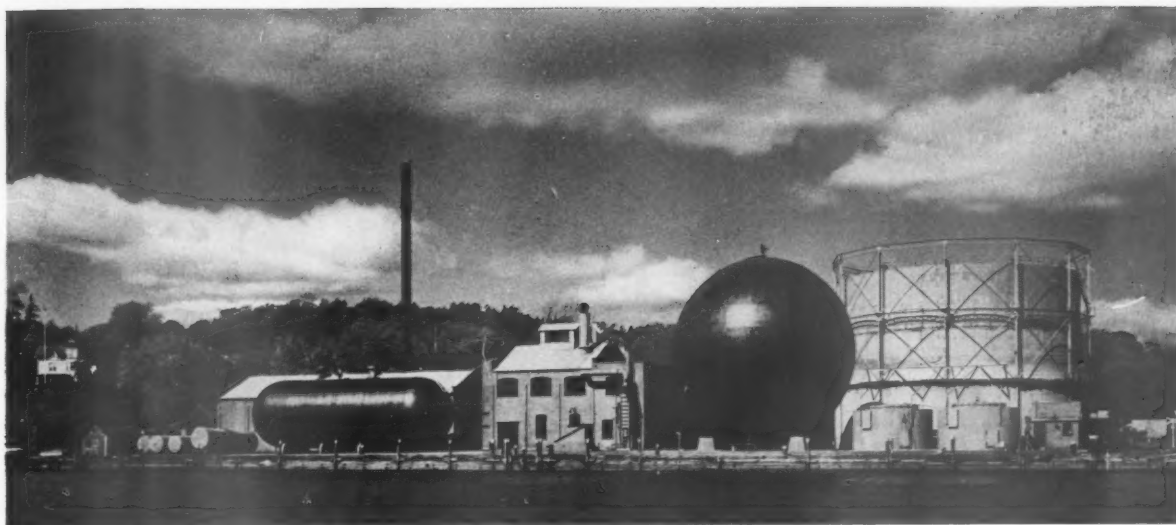
him by the Greek word 'Xaos,' or Chaos, and not by 'geest,' the Dutch for 'spirit.' The term Chaos seemed particularly appropriate because that was what existed when the world was in a gaseous state.

"But today we have chaos if the gas is shut off."

Don't Cook This Way



Photographs such as this, pointing out how to conserve household gas, are being issued to newspapers throughout the country by the Office of War Information



Kingston Gas Works

Gasoline for Carburetting Water Gas

Findings are reported covering the use of gasoline for carburetting water gas in an isolated 7'6" set operated both reforming and non-reforming over a period of several days with coke as generator fuel. A comparison of results is made with conventional gas-making oil, using the same equipment. Description of plant equipment, tabulation of technical data for the materials used and produced, and consideration of the economic factors involved are given.

By R. J. HORN

Central Hudson Gas & Electric Corporation, Poughkeepsie, New York

THE Office of the Petroleum Coordinator for War has suggested that unleaded gasoline or other motor fuel distillates may be available to gas companies for carburetting water gas possibly within the next few months, as a result of change of practices in refinery operations.

A plant test has been made by this company using gasoline as a carburetting medium. The test gasoline used was recommended by the New York office of the Petroleum Coordinator for War and was furnished from Titusville, Pennsylvania, by the Cities Service Company.

With the approval of the Office of Petroleum Coordinator and the Local Rationing Board in Kingston, N. Y., the gasoline, necessary for test purposes, was purchased.

Results obtained indicate that the permissible price payable for this carburetting material would possibly be about 3 or 4 mills per gallon above the price paid for gas oil to give the same net total cost for gas-making materials as with gas oil. During a continuous operating period of five consecutive days and three other operating periods of a few hours each on different days, no difficulties developed which would indicate the gasoline tested as being unsuitable for gas making. No effort was made to study the problem of handling and storing gasoline in gas works oil tanks in quantities necessary for full scale operations.

In order to determine the economic and physical aspects of water gas carburetion with gasoline, 30,544 gallons

of the gasoline were used at the Kingston Gas Works under regular operating conditions during several test periods in the months of October and November, 1942. This material had an octane rating of 65 maximum, and a Reid vapor pressure of 6.8 pounds. Table 1 shows the distillation characteristics of the gasoline.

The gasoline received in railroad tank cars was unloaded with a motor-driven centrifugal pump. The car, the railroad rails, the piping system, the pump and the 10,000 gallon horizontal storage tanks were grounded by a common conductor to the city water main, as a precaution against electrical potential between any of these objects, causing ignition of gasoline vapors

TABLE 1

Distillation of Gasoline Used in Test		
I. B. P.	104°F.	60% Dist. at 238°F.
10% Dist. at	162°F.	70% Dist. at 250°F.
20% Dist. at	184°F.	80% Dist. at 266°F.
30% Dist. at	202°F.	90% Dist. at 296°F.
40% Dist. at	216°F.	E.P. Dist. at 356°F.
50% Dist. at	226°F.	

TABLE 2—Summary of Results with Gasoline in 7' 6" Set

	Non-reforming	Reforming	All Test Runs Combined
Total Gas Made, MCF	4,801.6	3,634.0	10,122.2
Generator Fuel, Lbs.	131,300	85,810	268,550
Gasoline Used, Gal.	13,873	10,948	30,544
Quantities per MCF:			
Generator Fuel, Lbs.	27.4	23.6	26.5
Gasoline, Gal.	2.89	3.01	3.01
Tar, Gal.	0.02	0.02	0.02
Light Oil, Gal.	0.15	0.15	0.15
Net Tersian Factor	1.015	0.968	1.022
Heating Value of Gas:			
Before Compression	555	544	550
After Compression	537	537	537

which might be escaping. Figure 1 illustrates the grounding method used. The tanks were equipped with screened vents. No study was made of the actual losses of gasoline due to vaporization.

A water gas set with 7'6" generator, 7'0" carburetor and 7'0" superheater, with full backrun equipment was used at the Kingston Gas Works for this test. No other sets were operated at this plant and no gas was made from any other carburetting material during the test period. The two short test periods used on different days late in October were run in order to determine the proper pressures and correct size for oil spray drilling, and also in order to test out the piping and pumping equipment.

The generator used is lined with a thin wall faced with silicon carbide, giving an inside diameter of 6' 3½"

with an area of 31.09 square feet; and the carburetor is flued with 2½" spacings for a height of 7'6" up to the bottom of the cross-over connection from the generator. The superheater is checkered with 2½" spacings for a height of 9'6". An Anthony type oil spray with five 11/16" openings is installed in the carburetor and the same type of spray with one 11/16" opening is installed in the generator. No changes were made in these sprays during the tests reported herein.

All the gas made was cooled to 48° F. at the inlet of the exhauster, purified with iron oxide, metered and stored in a water sealed holder prior to compression. The generator fuel was by-product coke charged into the generator from buggies by hand. The relief holder is connected so that it floats on the line between the wash box off-take

and the primary cooler located just ahead of the exhauster. Tar was gathered from all the drips and the primary cooler and all other sources except the relief holder. Light oil was collected in the condensate from the aftercoolers following the compressor and from the high pressure storage holder. Analyses were made of the gas before and after compression and the heating value was determined at each of these two places. All the gas was compressed to 40 lbs. gauge and cooled at that pressure to 85°F.

Operating Periods

For purposes of examining the results, the test run with gasoline may be divided into three operating periods as follows: (1) Short preliminary runs (on two different days) for the purpose of adjusting and testing out facilities for introducing gasoline into the set and a final run for a few hours on the last day when little sampling was done and few analyses were made; (2) three days running non-reforming; and (3) two days running reforming. Table 2 summarizes the results for non-reforming and for reforming; and also for all gasoline runs combined, in which shrinkage and evaporation losses as well as poor results from trial adjustments and all other factors are included.

In order to establish a comparison with the oil ordinarily used at this

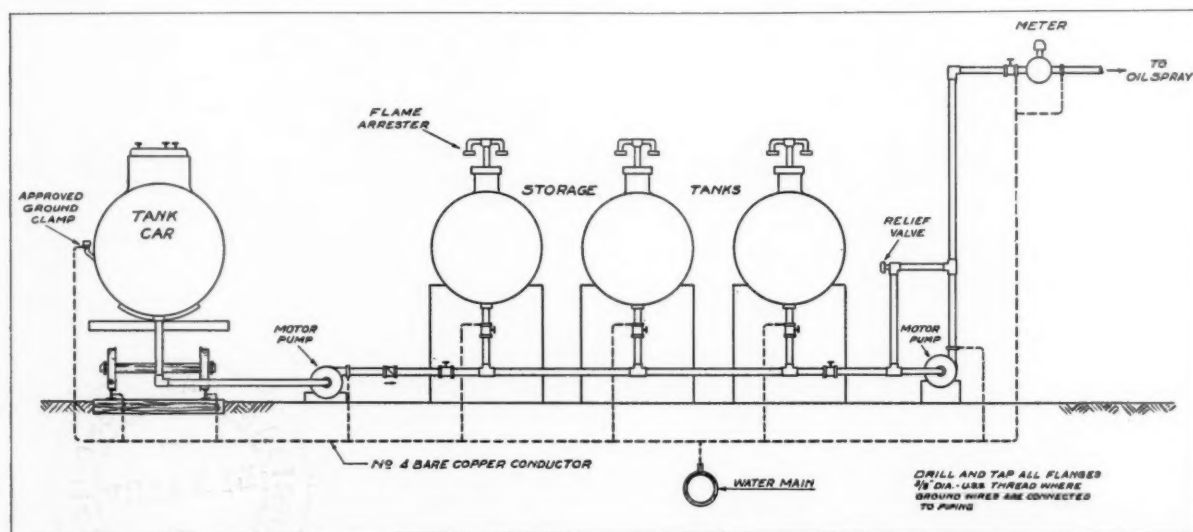


Figure 1—Grounding arrangement for unloading, storing, pumping and piping gasoline

plant, a second test run was made on the same set as used for the gasoline, six days after completion of the test run on gasoline. No gas was made in the plant during the six intervening days. On this test run of one day duration, the oil consisted of 67.4% gas oil of about 32 API. gravity and 32.6% Lima crude from wells in Ohio. The same conditions of operation prevailed during this test run as during the test run with gasoline, except that no reforming was done.

During two of the five days of the test run with gasoline, reforming was practiced to the extent of 20% of the total gasoline used each run. On the remaining three days, a straight operating cycle was used, similar to that common with gas oil, and in which 19% of the total gasoline was injected into the generator on the up run rather than on the back run as when reforming. A deposit of lamp-black or finely divided carbon in the ash while running reforming was noticeable but did not bother the fire-cleaners. This deposit was small and insignificant in comparison with that found in the ash of fires through which equivalent reforming with heavy oil is practiced.

Laboratory tests of this gasoline had indicated the optimum enrichment temperature to be at about 1400°F. Table 3 gives this and other laboratory data on the gasoline used as well as on the gas oil-Lima crude mixture used in the comparison test run following the gas-

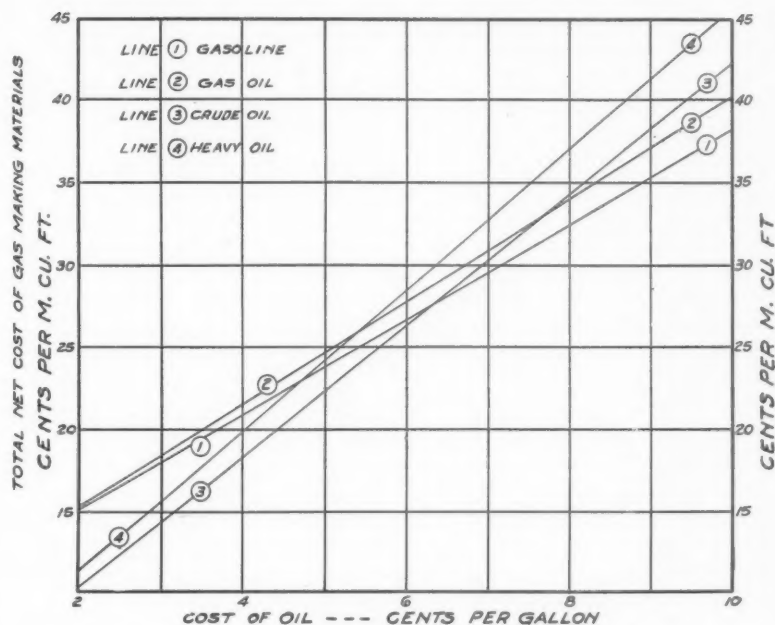


Figure 11—Total net cost of gas-making materials (537 B.t.u. gas)

oline test run. This was verified in set operations whereby the optimum temperature was found to be 1450°F. at the end of the blast period, with 1315°F. at the beginning. The temperature at the top of the superheater ranged from 1280°F. at the end of the blast to 1213°F. at the beginning. The average depth of fuel bed was 84", with an air blast pressure at the base of the generator of 50".

Variations in set temperatures were

made to determine the appearance of uncracked oil, naphthalene, and lamp-black, with the result that a temperature of 1350°F. to 1400°F. at the base of the superheater gave uncracked oil at the wash-box overflow seal; while at 1500°F. to 1550°F. tests indicated the appearance of naphthalene which had not been evident at 1400°F. to 1450°F.; and at 1550°F. lamp-black showed up.

Heating Value of Gas

The heating value of the gas was 555 B.t.u. non-reforming and 544 reforming before compression and 537 B.t.u. after compression in each case. The specific gravity during reforming with gasoline went up to 0.664 from 0.654 for non-reforming; and the hydrogen sulphide increased from 65 grains per hundred cubic feet to 70.

The hourly capacity of 88.9 MCF. while running with gasoline non-reforming was increased by 14.5% while running reforming with gasoline. The hourly capacity with the gas oil-Lima crude mixture at the plant was practically the same as with gasoline. Production rates with gasoline for both reforming and non-reforming and also for the gas oil-Lima crude mixture are shown in Table 4.

The B.t.u. contributed to the gas per

TABLE 3—Laboratory Cracking Test

	Gasoline	Mixture* of Gas Oil-Lima Crude
Cu.Ft. of Oil Gas Per Gal.:		
at 1300° F.	45.06	54.34
at 1400° F.	45.17	52.78
at 1500° F.	42.41	55.39
at 1600° F.	45.02	55.11
B.t.u. per Cu.Ft. of Oil Gas:		
at 1300° F.	2532	2038
at 1400° F.	2540	2083
at 1500° F.	2645	2053
at 1600° F.	2396	2060
Gas Enriching Value B.t.u./Gal.:		
at 1300° F.	114,000	110,800
at 1400° F.	114,800	109,900
at 1500° F.	112,200	113,700
at 1600° F.	107,900	113,500
Tar Formed (Calculated) per Gal. of Gasoline, Gal.:		
at 1300° F.	0.0535	0.1608
at 1400° F.	0.0486	0.1662
at 1500° F.	0.0644	0.1432
at 1600° F.	0.0905	0.1444

* 67.4% Gas Oil; 32.6% Lima Crude.

TABLE 4—Capacity Results for 7' 6" Set

	Gasoline		Mixture of Gas Oil-Lima Crude
	Non-Reforming	Reforming	
Total Hours Running, Hrs.	54.0	35.7	19.9
Gas Made, MCF.	4,801.6	3,634.0	1,794.6
Make per Hr., MCF.	88.9	101.8	90.2
Make per Sq.Ft. of Generator Area, MCF.	2.86	3.27	2.90
Make per Run, MCF.	9.03	10.01	8.27

gallon of gasoline was 112,500 B.t.u. or 99.1% of the laboratory figure, with non-reforming and 105,000 B.t.u. per gallon of gasoline when reforming was practiced. This compares with 103,100 B.t.u. from gas oil-Lima crude mixture as observed in this test. Table 5 gives data relative to the carbureting factors revealed by the tests.

residuum gas oil early in 1937 under conditions of compressing the gas to 50 pounds and cooling under pressure.

The quantity of tar produced with gasoline was carefully determined except for possibly a small portion of it which may have been lost in the relief holder. All the drips and the tar separator had been entirely cleaned of tar

TABLE 5—Carbureting Factors

	Gasoline		Mixture— Gas Oil-Lima Crude
	Non-Reforming	Reforming	
Total Heating Value B.t.u./Gal.	122,828	122,828	137,900
Enriching Value B.t.u./Gal.:			
From Lab. Cracking Test	113,500	113,500	112,600
From Plant Test Data Computation ..	112,500	105,000	103,100
Per Cent of Total Heat of Oil Appear- ing in Gas, %:			
By Lab. Cracking Test	92.4	92.4	81.7
By Plant Test Data	91.6	85.5	74.8
B.t.u. per Cu.Ft. of Gas Due to Oil Gas			
B.t.u. (Before Compression)	325	316	330
Net Tersian Factor	1.015	0.968	0.953

Light oil to the extent of 0.15 gallons per M was recovered in the high pressure drip. This was the same as observed with gas oil-Lima crude operation. Table 6 shows the composition of light oil recovered from gas made with gasoline by compression and cooling. It will be noted that the paraffinic hydrocarbon content of light oil produced from gasoline is rather high in the benzol, toluol, and solvent naphtha fractions, and also that the forerunnings are extremely high; so that possibly this light oil would have little, if any, value for nitration or for production of synthetic materials, under present methods of refining and processing light oil. If this should prove to be true, as is now apparent, the permissible price payable for gasoline would be reduced by about 2 or 3 mills per gallon below that indicated elsewhere in this article. For comparison there is also shown the composition of light oil recovered at the Poughkeepsie Gas Works using

before the test started and were completely emptied after the test ended, and there seemed to be no question that tar production with gasoline was extremely small. The quantity collected was equivalent to 0.02 gallons of tar per MCF.

A Net Tersian Factor, after allowing for light oil and tar production, averaging 0.992 for reforming and non-reforming combined was evident for the gasoline. This compares with the corresponding factor of 0.953 for the gas oil-Lima crude mixture used. The Net Tersian Factor is arrived at by adding 100 times the net oil per MCF. (after deducting tar and light oil) to 10 times the generator fuel per MCF. and dividing the sum by the B.t.u. of the finished gas.

Table 9 (page 20) gives the data for each of the three tests, together with computations showing the net total costs for gas-making materials for (1) gasoline reforming, (2) gasoline non-reforming and (3) the gas oil-Lima crude mixture. The prices for materials shown in Table 9 were those paid for the materials used without allowance for any possible reimbursements from governmental agencies for taxes paid in the original purchase price of gasoline.

Items 23 and 24 in Table 9 indicate that, aside from capacity considerations, the choice of reforming or non-reforming with gasoline would depend upon the relative costs of generator fuel and gasoline—low cost gasoline favoring reforming and low cost coke favoring non-reforming.

Economics of Process

An indication of the economics involved in the use of gasoline for making carburetted water gas is given in Table 7 and Figure II. Four operating

TABLE 6—Analysis of Recovered Light Oil

	Carbureting with Gasoline (Kingston 1942)	Carbureting with Residuum Gas Oil (Poughkeepsie 1937)
Crude, Distilling above 200° C.	Nil	Nil
Washing and Steam Distilling Loss	22.3%	41.0%
Forerunnings (Paraffins, Etc.)	6.8%	0.0%
Refined Benzol	26.0%	18.9%
Refined Toluol	24.1%	25.0%
Refined Solvent Naphtha, Distilling 140 to 200° C.	10.4%	13.6%
Paraffinic Hydrocarbons Distilling in Benzol, Toluol and Solvent Naphtha Range	8.3%	0.0%
Refined Solvent Naphtha Distilling Above 200° C.	0.8%	1.5%
Refined Distillation Loss	1.3%	0.0%
Paraffinic Hydrocarbon Content of Each Constitu- ent Separated in the Laboratory:		
Benzol	10.3%	0.0%
Toluol	12.1%	0.0%
Refined Solvent Naphtha	15.0%	4.0%

TABLE 7—Gas Making Materials (537 B.t.u. Gas After Compression)

	1 Gasoline	2 Gas Oil	3 Crude Oil	4 Heavy Oil
I—Quantities per MCF.				
A—Generator Fuel, Lbs.	27.30	30.10	25.00	20.00
B—Oil, Gal.	2.89	3.10	4.00	4.30
C—Tar, Gal.	0.02	0.60	1.30	1.00
D—Light Oil, Gal.	0.15	0.04	0.25	0.13
E—Net Oil*, Gal.	2.72	2.46	2.45	3.17
F—Net Tersian Factor	1.015	1.019	0.922	0.963
* Oil chargeable to gas making after deducting residuals.				
II—Prices per MCF.				
A—Fuel @ 0.4¢/Lb.	10.92	12.04	10.00	8.00
B—Oil @ 6¢/Gal.	17.34	18.60	24.00	25.80
C—Tar @ 4¢/Gal.08	2.40	5.20	4.00
D—Light Oil @ 10¢/Gal.	1.50	.40	2.50	1.30
E—Total Net Cost	26.68	27.84	26.30	28.50
EE—Total Net Cost at the Price of Oil Shown:				
1—Oil @ 2¢/Gal.	15.12	15.44	10.30	11.30
2—Oil @ 6¢/Gal.	26.68	27.84	26.30	28.50
3—Oil @ 10¢/Gal.	38.24	40.24	42.30	45.70

conditions are compared as follows; Column 1 for operation with gasoline, Column 2 for operation with gas oil, Column 3 for operation with a crude oil, and Column 4 for operation with a heavy oil. For simplicity a price of 6.0 cents per gallon is first assumed for all oils in the table and then to obtain data for the graph in Figure II various prices are assumed for all the oils, with all other unit prices remaining constant in all cases and with unit quantities of materials remaining constant at the values shown in Table 7. Under most circumstances it possibly would be inaccurate to use a fixed price for tar regardless of the kind of oil from which it originated, but for purposes of illustration a common price is used for tar as well as for all other materials. If used for boiler fuel, tars from all sources would likely have approximately equal value.

From Figure II it may be determined just what the total net cost of gas-making materials will be (with the prices and operating efficiencies given) for any price for oil between 2.0 cents per gallon and 10.0 cents.

By following a vertical line upward from the price per gallon selected until it crosses the line for the oil in question and reading the cents per MCF. scale horizontally opposite this point, a net figure to be compared with net figures similarly determined for other oils may be obtained.

Examination of Table 8 and Figure II shows that with gas oil at the prices shown in the first column of Table 8,

the comparative permissible price payable for any other oil studied would be that appearing in the column identifying that oil. For other operating results, or other efficiencies of conversion of materials, or other unit prices than those applied in Table 7, the permissible prices for oils would, of course, be different from that in Table 8. Permissible price is taken to mean that price payable for a given oil which may be substituted without changing the total net cost of gas-making materials.

Without allowing for fixed charges on, or additional operating expenses in connection with, special storage and handling facilities required for gasoline, it appears that, in situations where the assumed prices and efficiencies apply, gasoline can be used for carburetting water gas when it is available at a price of only a few mills above the price paid for other oils.

Conclusions:

1. Gasoline reacted satisfactorily as a carburetting medium in the water gas set used.

2. It appears that a price of about 5 per cent more per gallon could be paid for gasoline, nor deducting for the apparent inferior light oil produced than for gas oil—not allowing for special provisions to handle and store gasoline.

3. Set capacity with gasoline approximately equalled that with other oils used in the plant when not reforming.

4. The increase of 14.5% in set capacity when reforming gasoline over

that when not reforming would likely be equalled when reforming other oils in the plant.

5. Reforming could be justified only for the sake of additional capacity except where generator fuel is priced high and/or gasoline is priced low.

6. Handling gasoline to and from 10,000-gallon temporary storage tanks with motor pumps and temporary piping presented no difficulties under the precautions followed.

7. Gasoline appears to be sensitive to a narrow carburetting temperature range to which the set must be closely held to avoid uncracked oil escaping with low temperatures and the formation of naphthalene and lamp-black at high temperatures.

8. The B.t.u. contributed to the gas per gallon was 9 per cent more for gasoline non-reforming than for gas oil-Lima crude mixture.

9. Light oil production per MCF. was found to be approximately the same with gasoline as with gas oil; while the quality was found inferior.

10. Tar production per MCF. was found to be only 4 per cent of the quantity produced with gas oil.

TABLE 8—Comparative Permissible Price Payable for Oils Shown

(Price in Cents per Gallon)			
Gas Oil	Gasoline	Crude Oil	Heavy Oil
(2)	(1)	(3)	(4)
4.0	4.2	4.8	4.4
5.0	5.3	5.5	5.1
6.0	6.4	6.4	5.8
7.0	7.5	7.1	6.5
8.0	8.5	7.9	7.3
9.0	9.6	8.7	8.2

11. Hydrogen sulphide was considerably lower in the gas made from gasoline than generally found in that made from other oils.

12. The Net Tersian Factor for gasoline was found to be close to that for gas oil and poorer than that for gas oil-Lima crude mixture.

13. In general, gasoline was found suitable for gas making and it appears that where it can be safely handled and stored, it would, at the proper price, be a suitable material for carburetting water gas.

**TABLE 9—COMPARISON OF GASOLINE WITH A MIXTURE OF
67.4% GAS OIL AND 32.6% LIMA FOR GAS-MAKING AT THE
KINGSTON GAS WORKS**

7'-6" GEN. WITH 6'-9 1/2" I.D., 7'-0" CARBURETOR 7'-0" SUPERHEATER, 3-WAY VALVE BACK RUN				1	2	3
1. DATES OF OPERATION: 1942	NOV. 9, 10 & 13	NOV. 11 & 12	NOV. 13			
2. OIL USED	GASOLINE	GASOLINE	GAS OIL			
3. SOURCE OF OIL	NON-REFORMING TITUSVILLE PENNA.	REFORMING TITUSVILLE PENNA.	B.LIMA CR REFINERY AND OHIO			
4. ANALYSIS OF OIL & GENERATOR FUEL:						
A. GRAVITY-API @ 60°F. DEG.	63.7	63.7	35.7			
B. HEATING VALUE PER GAL. - B.T.U.	122,828	122,828	137,300			
C. HEATING VALUE PER LB. - B.T.U.	20,356	20,356	15,577			
D. CARBON RESIDUE - BY WT.-%	NIL	NIL	0.56			
E. SULPHUR - PER CENT.	0.11	0.11	0.22			
F. VISCOSITY SAYBOLT UNIV. @ 100°F.	28.6 SEC.	28.6 SEC.	44 SEC.			
G. ENRICHING VALUE - B.T.U./G (LAB.)	113,500	113,500	113,500			
H. ENRICHING @ °F SHOWN	1450	1450	1470			
I. OLEFINS	4.0%	4.0%	13.3%			
J. AROMATICS	8.6%	8.6%	13.0%			
K. NAPHTHENES	0.9%	0.9%	14.7%			
L. PARAFFINS	86.5%	86.5%	39.0%			
M. AVAILABLE FOR ENRICHMENT CALC.	32.4%	32.4%	76.6%			
N. OIL TEMP. TO SET - °F.	60	60	46			
O. OIL PRES. TO SET - LBS. GAGE	40	40	100			
5. ANALYSIS OF COKE:						
A. FIXED CARBON	30.6%	30.6%	30.6%			
B. VOLATILE MATTER	1.0%	1.0%	1.0%			
C. ASH	8.4%	8.4%	8.4%			
D. MOISTURE AS CHARGED	1.8%	1.8%	1.8%			
E. B.T.U./LB. AS CHARGED	13,145	13,145	13,145			
F. FUSION TEMP. OF ASH, °F.	2750	2750	2750			
G. SULFUR	0.7%	0.7%	0.7%			
6. AVERAGE CYCLE:						
A. TOTAL LENGTH IN SECONDS	300	300	300			
B. BLOW IN SECONDS AND PER CENT.	33 & 31	33 & 28	33 & 31			
C. BLOW RUN IN SEC. AND PER CENT.	0 & 0	0 & 0	0 & 0			
D. UPRUN - IN SEC. & %	34 & 31.3	34 & 31.3	34 & 31.3			
E. BACKRUN - IN SEC. & %	56 & 28.7	56 & 28.7	56 & 28.7			
F. FINAL UPRUN - IN SEC. & %	18 & 6.0	18 & 6.0	18 & 6.0			
G. AIR PURGE - IN SEC. & %	3 & 3.0	3 & 3.0	3 & 3.0			
H. CARBURETOR AIR ON - SEC. & %	81 & 27.0	81 & 27.0	81 & 27.0			
7. AIR:						
A. GENERATOR, CU. FT./MIN.	5500	5500	5500			
B. CARBURETOR, CU. FT./MIN.	1800	1800	1800			
C. GENERATOR PER MCF.	344	853	1030			
D. CARBURETOR PER MCF.	269	243	234			
8. STEAM:						
A. UPRUN - LBS./MIN.	30	30	30			
B. BACKRUN - LBS./MIN.	120	120	120			
C. TOTAL - LBS./MCF.	34.7	31.3	24.5			
9. OIL PER RUN:						
A. TOTAL GAL.	26.1	30.2	26.4			
B. ENRICHMENT TO CARBURETOR	21.1	24.2	21.5			
C. TO GENERATOR - NON REFORMING	5.0	—	5.0			
D. TO GENERATOR - REFORMING	—	6.0	—			
10. OIL RATE - GALLONS PER MINUTE:						
A. TO CARBURETOR	14.5	17.4	15.2			
B. TO GENERATOR - NON REFORMING	3.6	—	3.6			
C. TO GENERATOR - REFORMING	—	4.3	—			
11. TEMPERATURE AT SUPERHEATER BASE:						
A. END OF BLAST - °F.	1450	1450	1470			
B. BEGINNING OF BLAST - °F.	1315	1315	1380			
TEMPERATURE TOP OF SUPERHEATER:						
A. END OF BLAST - °F.	1280	1280	1215			
B. BEGINNING OF BLAST - °F.	1213	1213	1105			
12. GEN. BASE BLAST PRES. - IN. WATER	50"	50"	50"			
13. AVG. DEPTH FUEL BED - INCHES	84"	84"	84"			
14. AVG. WT. PER CHARGE OF FUEL - LBS.	1500	1500	1500			
15. ANALYSIS OF GAS:						
A. BEFORE COMPRESSION						
(1) CO ₂ %	6.0	5.2	5.2			
ILL %	10.0	9.5	10.3			
O ₂ %	0.5	0.5	0.4			
CO %	29.3	29.4	28.7			
H ₂ %	32.8	36.4	35.5			
CH ₄ %	12.4	11.7	12.3			
N ₂ %	3.0	7.1	7.4			
(2) B.T.U. PER CU. FT.	555	544	553			
(3) H ₂ S - GR./C (UNPURIFIED)	65	70	100			
(4) SP. GR. (BY SHILLING)	0.654	0.660	0.655			
B. AFTER COMPRESSION						
(1) CO ₂ %	5.7	5.0	5.2			
ILL %	9.6	9.3	9.3			
O ₂ %	0.5	0.6	0.6			
CO %	28.5	28.6	28.8			
H ₂ %	33.1	34.7	33.6			
CH ₄ %	13.3	12.6	12.4			
N ₂ %	3.3	3.1	7.5			
(2) B.T.U. PER CU. FT.	537	537	531			
(3) H ₂ S - GR./C	NONE	NONE	NONE			
(4) SP. GR. (BY SHILLING)	0.654	0.664	0.655			
C. BLAST GASES TOP OF GENERATOR:						
(1) CO ₂ %	9.5	11.4	13.2			
ILL %	0.0	0.0	0.0			
O ₂ %	0.5	0.2	0.6			
CO %	11.8	7.5	6.5			
H ₂ %	0.0	0.0	0.0			
CH ₄ %	0.0	0.0	0.0			
N ₂ %	78.2	80.9	79.7			
D. BLAST GASES SUPERHEATER STACK:						
(1) CO ₂ %	12.0	13.1	16.3			
ILL %	0.0	0.0	0.0			
O ₂ %	3.0	8.0	3.9			
CO %	0.0	0.0	0.0			
H ₂ %	0.0	0.0	0.0			
CH ₄ %	0.0	0.0	0.0			
N ₂ %	13.0	78.9	79.8			
E. UPRUN GAS TOP OF GENERATOR:						
(1) CO ₂ %	3.6	3.0	3.0			
ILL %	0.0	0.3	0.2			
O ₂ %	0.4	0.7	0.6			
CO %	43.8	43.8	47.1			
H ₂ %	44.6	47.6	47.1			
CH ₄ %	0.8	1.1	1.2			
N ₂ %	6.6	3.5	4.7			
F. BACKRUN GAS FROM BACKRUN PIPE:						
(1) CO ₂ %	7.5	3.7	5.8			
ILL %	0.1	0.5	0.2			
O ₂ %	0.4	0.3	0.5			
CO %	35.8	29.5	37.0			
H ₂ %	50.6	56.8	48.4			
CH ₄ %	1.4	3.2	3.2			
N ₂ %	4.0	3.6	8.2			
15.2. TEMPERATURE WHERE:-						
1. UNCRACKED OIL APPEARS, °F.	1350-1400	1350-1400	1300-1350			
2. NAPHTHALENE APPEARS, °F.	1500-1550	1500-1550	1500-1550			
3. LAMPBLACK APPEARS, °F.	1550	1550	1500-1550			
16. COMPRESSION:						
A. PRES. - LBS. GAGE	40	40	40			
B. AFTERCOOLER TEMP. IN °F.	205	205	205			
C. AFTERCOOLER TEMP. OUT °F.	85	85	85			
17. RUNNING TIME - DAYS	3	2	1			
HOURS	54.0	35.7	19.9			
AVG. DAILY CLINKERING TIME - HRS.	5	5	5			
18. CORRECTED GAS MADE - MCF.	4810.6	5634.0	1794.6			
19. MAKE PER RUNNING, MCF:						
A. TOTAL	29.9	101.8	30.2			
B. PER SQ. FT. GENERATOR AREA	2.96	3.27	2.80			
20. TOTAL RUNS	532	363	217			
21. MCF PER RUN	9.03	10.01	8.27			
22. TOTAL QUANTITIES:						
A. COKE - LBS.	131,300	85,810	45,382			
B. OIL OR GASOLINE - GAL.	13,873	10,348	8,744			
C. TAR PRODUCED - GAL.	36	72	351			
D. LIGHT OIL PRODUCED - GAL.	720	545	263			
E. TOTAL RESIDUALS, (C+D) - GAL.	816	617	1820			
F. LINE B MINUS LINE E - GAL.	13,057	10,331	4324			
23.1 QUANTITIES PER MCF BEFORE COMPRESS:						
A. COKE - LBS.	27.3	23.6	25.4			
B. OIL OR GASOLINE - GAL.	2.89	3.01	3.20			
C. TAR PRODUCED - GAL.	0.02	0.02	0.33			
D. LIGHT OIL PRODUCED - GAL.	0.15	0.15	0.15			
E. NET OIL, B-(C+D) - GAL.	2.72	2.84	2.82			
23.2 NET TERSIAN FACTOR	1.015	0.968	0.953			
23.3 B.T.U. CONTRIBUTED TO GAS PER GAL.	112,500	105,000	103,100			
23.4 CU. FT. OIL GAS PER GAL.	53.6	41.8	61.9			
23.5 B.T.U. PER CU. FT. OIL GAS	2037	1700	1667			
23.6 B.T.U. PER CU. FT. GAS DUE TO OIL GAS	325	316	330			
23.7 COLD GAS EFFICIENCY PER CENT:						
(A) BASED ON GROSS OIL	77.7	80.0	71.3			
(B) BASED ON NET OIL	80.1	82.5	81.2			
24. COST - DOLLARS PER MCF						
A. COKE @ .0047306 LB. \$	0.131	0.113	0.122			
B. GAS OIL @ 5.56 GAL. \$	—	—	0.176			
BB. GASOLINE @ 5.56 GAL. \$	0.431	0.471	—			
C. COKE PLUS ENRICHER. \$	0.562	0.584	0.298			
D. TAR @ 5¢/M. \$	0.001	0.001	0.026			
E. LIGHT OIL @ 10¢/M. \$	0.015	0.015	0.015			
F. TAR AND LIGHT OIL	0.016	0.016	0.041			
G. NET. LINE C MINUS LINE F, \$	0.566	0.568	0.257			

Synthetic Products . . . Natural Gas

Derivatives Make Vital War Contributions



Dr. Egloff

FOR many years natural gas has been used mainly for heating and generation of steam and electrical power. In the last few years, however, the tempo of research and development has increased enormously. A much higher field of utilization for natural gas than as fuel is seen in the conversion of the hydrocarbons into superior aviation gasolines, lubricants, synthetic rubber, explosives, acetylene, anaesthetics, plant life promoters, plastics, solvents, and many other chemical derivatives. A vast supply of these derivatives is available in natural gas produced in this country.

Wide Avenues for Development

The processes and methods for such conversion in some instances are already in commercial use in the petroleum refining and other industries. Other methods have been worked out in the research laboratories and the processes and yields that can be achieved are known; but it remains necessary for further research to establish the means to reduce costs to the level of commercial practicability. Another wide avenue for future development in the natural gasoline and refining industries is thus foreseen.

Natural gas is consumed at the rate of over 2.6 trillion cu. ft. per year. The U. S. A. has proven reserves of 85 trillion cu. ft. and another 85 trillion as potential reserves. The yearly consumption of natural gas is equivalent in fuel value to 100,000,000 tons of coal or over 500,000,000 barrels of fuel oil.

Paper presented before Interstate Oil Compact Commission, Chicago, October 3, 1942.

By DR. GUSTAV EGLOFF

*Director of Research
Universal Oil Products Co.,
Chicago, Ill.*

Hydrocarbons present in natural gas are methane, ethane, propane, butanes, pentanes, hexanes, and heptanes, etc. The first four of those are gases while from pentane on they are liquids useful as gasoline.

The individual hydrocarbons have a variety of uses in a number of industries. Propane has been suggested for use as a fuel for breaking in aviation engines on the "test block," since it has a high octane value and is readily available. Such a procedure would conserve the 100 octane liquid fuels needed for fighter, bombing, and cargo airplanes in the war effort. Other uses for propane which have gained wide commercial application are as refrigerants and solvents in the refining of lubricating oils. Paraffin wax, asphaltic substances, naphthenic hydrocarbons and other materials are eliminated from lubricants when propane is used as the solvent. Over 50 per cent of the world's lubricating oils are improved in quality by the use of propane.

Two hydrocarbons present in natural gas of great utility are isobutane

and isopentane. Isobutane is the key hydrocarbon in the production of aviation gasoline by alkylation with olefins. In general, there is not enough isobutane available, hence it has been necessary to isomerize the normal butane present in natural gas to the iso compound. A number of commercial installations are in operation and under construction to isomerize normal butane to isobutane. Normal and isopentane are also present in natural gas, and it is highly desirable to fractionate out the iso compound due to its 91 octane rating in contrast to the normal which has an octane number of 64. Isopentane is blended with aviation gasoline in percentages ranging from 10 to 20, depending upon the other components in the final blend.

Aviation Fuel Program

Olefinic hydrocarbons, not contained in natural gas as such, are important for many reactions not alone for aviation gasoline but for synthetic rubber and a host of other products. There are several routings to produce olefins from natural gas: one is high temperature, and the other by catalysis. The olefinic hydrocarbons which are now in great demand are ethylene, propylene, butylenes, pentylenes and butadiene. Natural gas, particularly the propane-butane fraction, when subjected to high temperature cracking, produces ethylene, propylene, butylenes and butadiene. Normal butane is readily converted into butadiene in one or two stages by catalytic means at high temperature with yields reported of over sixty per cent.

A branched chain paraffin, isooctane, is of great importance in the aviation fuel program. Isooctane has an octane rating of 95-100. Another method of producing aviation gasoline is to polymerize the propylene, butylenes, and pentylenes present in

- As a nationally recognized authority on chemical research, Dr. Egloff's study of synthetic war products derived from natural gas is of unusual interest.
- In this article he discusses the conversion of hydrocarbons into aviation gasoline, lubricants, synthetic rubber, explosives, acetylene, anaesthetics, plastics, solvents and many other natural gas derivatives.
- Dr. Egloff's article is being published in two parts and will be completed in the February issue.

cracked gases to a polymer gasoline under selective conditions which upon hydrogenation yields an aviation gasoline blending product of 90 octane rating.

The polymerization process has been largely replaced by the alkylation process in which isobutane is alkylated by butylenes in the presence of sulfuric or hydrofluoric acid catalysts. The resulting alkylate ranges in octane value from 91 to 96. The simplest of the olefins is ethylene which is used to alkylate isobutane at temperatures in the order of 990° F. and pressures up to 5000 lbs. This reaction produces neohexane having an octane rating of 94, an important hydrocarbon for aviation gasoline. In addition to alkylating ethylene and butylenes, propylene and pentylenes are also being alkylated with isobutane to form additional quantities of high quality aviation gasoline. It is proposed in some type of operation to utilize the mixtures of propylene, butylenes and pentylenes in the alkylation reaction with isobutane using hydrofluoric acid as alkylating catalyst to produce alkylate of 91 octane rating highly suitable for aviation gasoline blending stock.

An important aviation blending fuel of an entirely different type is cumene, which is produced from the alkylation of propylene and benzene in the presence of solid phosphoric acid. A number of commercial units are now in operation.

Hexane and Heptane

Normal hexane and heptane are two hydrocarbons which from a motor fuel standpoint are practically worthless unless their molecular structure is changed. Normal heptane has a zero octane rating and hexane about 25. These straight-chain paraffin hydrocarbons, hexane and heptane, can be changed in configuration and also in their properties to improve their antiknock properties. Hexane and heptane can also be converted into benzene and toluene—two important hydrocarbons for high explosives. Benzene is of vital importance in the production of styrene, which is produced by the alkylation of benzene with ethylene forming ethyl benzene. Dehydrogenation of this compound yields styrene. When styrene (25%)

and butadiene (75%) are mixed in the presence of a catalyst such as peroxide, polymerization takes place to form the synthetic rubber Buna-S.

The synthetic rubber program in the U. S. calls for 886,000 tons as planned in September 1942, distributed as follows:

Types	Tons
Buna-S	705,000
Butyl	132,000
Neoprene	49,000

However, the recommendations of the Baruch Committee called for an increase of 220,000 tons to be apportioned as:

Types	Tons
Buna-S	140,000
Neoprene	20,000
Thiokol	60,000

Out of the total 886,000 tons of synthetic rubber planned for the United States, 705,000 tons of it will come from butadiene and styrene. The normal butane that will be used for butadiene will represent about 80,000 tons a year derived largely from natural gas. One plant has a rated capacity of 66,000 tons and the other 15,000 tons a year.

Butane in Natural Gas

More than 100,000 barrels a day of normal butane are available from natural gas. If this were used just for butadiene making, it would satisfy the entire butadiene requirements in our present synthetic rubber program. Hence, it can be seen that the natural gas industry has more than enough of the hydrocarbons which can be converted into raw materials to supply the entire synthetic rubber program. Another important source of butadiene is through the dehydrogenation of butylene derived from catalytic cracking. This source will yield at the rate of 283,000 tons annually.

Another type of synthetic rubber is called Thiokol, made by chlorination of ethylene which is then refluxed with sodium polysulfide. The synthetic rubber program calls for 60,000 tons of Thiokol yearly. Hydrogen sulfide is present in varying percentages in natural gas and is readily converted into flowers of sulfur. This sulfur may react with caustic soda to produce sodium polysulfide. After re-

acting ethylene with chlorine, the dichlorethane is formed which reacts with the polysulfide yielding Thiokol. The plans call for the use of Thiokol in retreading of tires.

Besides butadiene, styrene, and ethylene, a hydrocarbon of great importance is acetylene, used in the production of the synthetic rubber, neoprene; it is also the base material for nylon, a replacement product for silk.

Natural gas or products therefrom under high temperature conditions yield acetylene readily. Two commercial acetylene units are being installed at the present time, one of which will produce at the rate of 75 tons per day or 27,000 tons a year. Other units are also under way. The charging stock may be either propane, butane, natural gasoline or fractions from petroleum.

Synthetic Rubber Prospects

Germany uses acetylene made from calcium carbide converting it into butadiene by a four-stage chemical process. Neoprene rubber is made from acetylene treated with hydrochloric acid. This type of rubber will be produced at the rate of 49,000 tons a year in the United States.

The Russians start primarily with ethyl alcohol from grain to produce butadiene. Butadiene from ethyl alcohol derived from grain will be one of the sources in the U. S. synthetic rubber program. The tonnage of butadiene from grain alcohol will be at the rate of 242,000 a year, representing about one-third of the Buna-S type production.

There are several other types of rubber which are in commercial production, one of which is the type based on isobutylene from dehydrogenation of isobutane from natural gas or from cracking of oil. Isobutylene is copolymerized with about two per cent of butadiene or isoprene resulting in a product called Butyl rubber. In the government program this type of rubber will be produced at the rate of 132,000 tons a year. Butyl rubber, as of today, is not as good a synthetic rubber for tire use as the Buna-S. Tires made of Butyl rubber have a mileage life of about 12,000 miles with a maximum road speed of

(Continued on page 32)



Part of group entertained by the Selectees' Club. On the right is Mr. Loomis, merchandise sales manager of the Detroit company

Selectees' Club Keeps Up Spirits of Those Left Behind

By NEWELL E. LOOMIS
Merchandise Sales Manager, Michigan
Consolidated Gas Company

OF all the employee social activities carried on through cooperation of the Michigan Consolidated Gas Company, Detroit, probably the one that has the most popular appeal is the doings of the Selectee Club, organized and operated by the girl employees, although practically everybody takes some part in helping it along.

This Selectee Club was started in July, 1940, by a few girls getting together to do something for the 38 gas company employees then in service. The club has grown as an increasing number of gas company employees joined the armed forces and now every month the 184 men and one woman who are scattered around the world receive a package containing much appreciated things that are hard to get where they may be located. These girls are maintaining a line of communication with old friends and associates in the fighting forces.

The first of November the girls who make up the Selectee Club decided it would be nice to entertain the mothers, wives, sisters and sweethearts of our men who had left the company to join the Armed Forces. The time was set for the afternoon of December 5 and when the members of this organization put their hearts into a project they are sure to come through with something fine and big.

One hundred and thirty women responded to invitations and met for tea in the specially decorated gas company auditorium, which turned out to be one of the outstanding social events in the company's history.

Upon arrival each guest was given a corsage, to which was attached a card showing the guests' name, for ready identification by others. The party opened by singing the National Anthem, with two little girls, daughters of gas company employees, posting the colors on the stage.

Miss Ethel Bukart, president of the Selectee Club, gave an address of welcome to the ladies, Mr. Fink, assistant general manager, spoke briefly on behalf of the company, with appropriate piano and vocal solos following. At the close of the program, refreshments were served and the ladies were given an opportunity to get acquainted.

It has been said that it is hardest for those who only watch and wait, and it is activities like this that help to keep up the spirit of those on the Home Front.

Story of Hugoton Gas Field Told

THE December 12 issue of the *Saturday Evening Post* carries an informative article on the vast Hugoton natural gas field by Paul I. Wellman entitled "Bubble Beneath the Plains." According to Mr. Wellman, this bubble of natural gas which underlies the old Dust Bowl is the biggest in the world. To quote from his article further:

"Nobody looking at the dusty flatness of these plains would think of them in connection with tanks, machine guns and other weapons of war. But the old Dust Bowl is intimately tied up with war production. Today it is furnishing fuel for hundreds of war industries, some of them 1000 miles away, ranging as far as Minneapolis in the north and Detroit to the east. It is served by the world's longest cross-country gas pipe line, which is so highly important to America's victory effort that it is guarded from the Great Lakes to Texas to prevent sabotage.

"So prodigious is the great underlying bubble of gas that men haven't yet found the limits of the area it occupies, save that it rivals some states in size. It is known as the Hugoton gas field, and it dwarfs even the mighty Amarillo field of the Texas Panhandle.

"A few wells—a very few, comparatively

—have punctured the envelope of this Gargantuan bubble, and from these scattered punctures natural gas flows to cities in ten states—Michigan, Illinois, Oklahoma, Indiana, Ohio, Missouri, Iowa, Kansas, Nebraska and Colorado. Yet the Hugoton field has just begun to produce, and in spite of its immense pipe-line withdrawals, the reserve supplies, according to scientific estimate, will last two centuries or more at the present rate."

Priority-Free Lunchbox Developed by Utility



Faced with a shortage of metal lunch boxes, Public Service Electric & Gas Company, Newark, N. J., developed a "Victory Lunch Kit" made of water resistant fabric and brown leatherette—both non-priority materials. The largest department store in Public Service's territory, L. Bamberger & Company, became interested and placed the kit on sale, using the above advertisement in a large size. As explained in the ad, each kit will hold a man-sized lunch, including a thermos for hot stew or soup. The store inclosed a copy of the Public Service booklet "Pack-a-Lunch for Victory" in the first 500 kits sold. According to latest advice the kit has sold extremely well, more than 800 having been disposed of the first day.

Companies interested in having this kit placed on sale locally should correspond with Thomas H. Spain, advertising manager, Public Service Electric & Gas Company, 80 Park Place, Newark, N. J.

Accident Prevention . . . *National* *Committee Streamlines for Wartime Service*

THE conservation of manpower has taken on added significance during wartime. Every available man-hour of work must be utilized to supply the growing demands of a constantly expanding army, navy and air force. We cannot afford to lose priceless man-days because of unnecessary accidents.

The Accident Prevention Committee of the American Gas Association, realizing that safety problems of the industry have multiplied due to increased production schedules, shortage of vital materials and equipment, new and untrained employees, the conversion to other forms of transportation, and possible exposure of employees to enemy raiders, reorganized its activities during the Association year just closed in order to better coordinate its work program and to increase the effectiveness of the safety service made available to member companies.

Record of Achievement

It is felt that a review of the committee's activities during the past year, and a statement as to its objectives for the year ahead will serve a useful purpose by informing member companies as to the services available through the committee.

During the year fifteen McCarter Medals, thirteen bars, and three certificates of assistance were awarded to gas utility employees performing successful resuscitations by the prone pressure method. Since the McCarter Medal was announced in 1923, a total of 735 medals, 43 bars, and 261 certificates have been awarded. Bars are awarded to those making two or more successful resuscitations. The significance of this 19-year record is that gas industry employees have saved at least 778 lives by resuscitating asphyxiation victims. In addition, there have been many other life-saving cases by other forms of first-aid treatment, such as treat-

By CECIL L. HIGHTOWER

*Chairman, A. G. A. Accident
Prevention Committee*

ment for shock, and the control of arterial bleeding.

The McCarter Medal is available to any employee of the gas industry who by use of the Prone Pressure Method successfully resuscitates another person who has been asphyxiated by the inhalation of utility gas. It constitutes public recognition for unselfish service to the cause of life saving, and member companies are urged to file applications with the committee on all cases meriting the award. Attention is directed to the fact that applications must be filed within one year of the date resuscitation takes place.

Foremen's Safety Messages serve a useful purpose by emphasizing the supervisor's responsibility for establishing safety as a part of the operating program, and by pointing out how the foreman can maintain the interest of his employees in accident prevention activities. Many companies reproduce these letters over the signature of an operating manager or executive and distribute them to their supervising force. Others reproduce and publish the messages in the company house organ. Both methods have proved effective.

During the past year the committee

developed and released seven of these informative and instructive messages.

The A. G. A. Safety News Bulletin was revived during the year and two issues were distributed. These bulletins feature reports of serious or unusual accidents, new safety kinks and wrinkles, and educational material suitable for use in conducting employee safety meetings. In order to conserve paper, and with the thought of reaching the operating personnel in a more direct way, the bulletin will be included in the A. G. A. MONTHLY, starting with the February issue, and will appear each month under the title of "Safety Trends."

The following operating units of member companies were awarded "Million Man-Hour" Certificates for operating 1,000,000 or more man-hours without a disabling injury: Oklahoma Natural Gas Company, Oklahoma City District, and five divisions of The Ohio Fuel Gas Company, i.e. Elyria; Toledo; Northern Compressor Division, Columbus; Distribution Department, District No. 5, Mansfield; and the Southern Compressor Division, Columbus.

These awards serve to stimulate and maintain the interest of employees in the accident prevention program and member companies are urged to file application for such awards where operating units establish a record of one



C. L. Hightower

Mr. Hightower, who heads up this year's national accident prevention program in the gas industry, is well qualified to undertake this important wartime activity. He has been engaged in safety work since 1922, first for the Dallas Power & Light Company, of which he became personnel director, and later as safety and insurance commissioner of the Texas Pacific Coal and Oil Company. In 1934 he began his present position as safety director for the United Gas Pipe Line Company, Shreveport, La.

He is State representative for Louisiana on the National Committee for the Conservation of Manpower in War Industries, and a past general chairman of the Petroleum Section of the National Safety Council. He is also a past president of the Gulf Coast and Ark-La-Tex chapters of the American Society of Safety Engineers.

million man-hours without a disabling injury.

The committee prepared and distributed a report on Fatal Injuries in the Gas Industry for the years 1939-'40 and '41. This report includes interesting information on the cause of fatal accidents and points to the possible elimination or correction of the causes responsible. In the future this report will be released annually, and it is felt that foremen and department heads will find it useful as a check against practices being followed in their own operations, as well as suitable for discussion material at safety meetings.

A report on "Welding Gas Lines Under Pressure," which summarizes the practices and experiences of seventy-five gas companies, was prepared by the committee during the year. Copies of this report are available from A. G. A. headquarters.

Service Medal

Although two applications were received for the Meritorious Service Medal during the year, neither of them were found to conform with the requirements. This certificate is available to employees of member companies who have shown meritorious and conspicuous judgment, intelligence, or bravery in saving human life either in the plant or works of any gas undertaking or having to do with the handling of the materials of manufacture or of the products manufactured or distributed. It is urged that applications for this award be filed in all cases meriting the award.

Realizing the growing importance of the bicycle as a means of transportation, especially in distribution operations, the committee made a study of this problem and prepared a report of its findings which appeared in the last issue of the A. G. A. MONTHLY. Copies of the report have been distributed to members of the Accident Prevention Committee, and additional copies may be obtained by writing Association headquarters.

One of the primary functions of the Accident Prevention Committee is the testing and approval of safety devices and protective equipment. Several types of positive pressure resuscitation de-

vices were examined by the committee during the year and rejected on the basis that they were not practical for field use by laymen. A report on this subject was included in the March issue of the A. G. A. MONTHLY.

For the coming year the committee feels that it should undertake only essential activities which will promote the safety of gas industry workers in wartime. This approach to our accident prevention problem requires close study and observation of new developments in the several branches of our industry. To provide the set-up for such studies as well as to better coordinate the work of the committee definite objectives and work procedures have been adopted. Following is an outline of the committee's objectives and work procedure with the names of chairmen of the various subcommittees shown:

Objectives

The primary objectives of the American Gas Association Accident Prevention Committee are:

1. To provide a medium for the exchange of information between member company safety representatives on their accident prevention problems.
2. To keep member companies advised on new developments in the field of accident prevention.
3. To stimulate interest in safety within the gas industry.
4. To serve as an advisory and consultation agency on information and material released by the National Safety Council and other organizations on the safe handling and use of gas.
5. To gather information on accident experience within the industry and prepare and distribute comparison reports.
6. To study and test new safety devices and personal protective equipment items and advise the industry as to the results of its findings.
7. To assist individual member companies in an advisory capacity on any special accident prevention problems that may be presented to the committee.
8. To develop educational material and factual data on special safety subjects for release to member companies as the need for same develops.
9. To work closely with the Associ-

ation's Medical Advisor on any health problems that may arise which affect the gas industry.

10. To recognize good "No Accident" records established by member companies by the awarding of "Million-Man-Hour" certificates.

11. To administer the McCarter Medal and Meritorious Service Medal award plans.

12. Assist and cooperate in planning the programs for Association meetings to insure that accident prevention is given a place in general association activities.

Subcommittee Organization

The following standing subcommittees insure that the various phases of the program will be carried on from year to year without interruption due to changes in committee personnel:

- Advisory
 - Safety in Distribution
 - Safe Natural Gas Operations
 - Safe Manufactured Gas Operations
 - A. G. A. Safety Bulletin
- *Safety Equipment
- *Accident Reporting and Recording
- *Safety Codes and Manuals
- Education
 - Safety Posters
- *Health
- *Awards
- *Safety Meetings and Programs

Duties of Subcommittees

Advisory—Cecil L. Hightower, United Gas Pipe Line Co., Shreveport, La., chairman. Composed of the past four chairmen of the general committee, this group serves in an advisory capacity to the current chairman and works with him in developing policy and methods of procedure.

Safety in Distribution—James H. Motz, Atlanta Gas Light Co., Atlanta, Ga., chairman. Prepares all safety material released by the committee which relates specifically to distribution operations.

Safe Natural Gas Operations—Q. R. Dungan, Cities Service Gas Co., Bartlesville, Okla., chairman. Prepares all safety material released by the committee which relates to safe natural gas operations other than distribution.

Safe Manufactured Gas Operations—W. E. Lebo, Public Service Electric &

* Normally composed of the chairman of the subcommittee only.

Gas Co., Harrison, N. J., chairman. Prepares all safety material released by the committee which relates to safe manufactured gas operations other than distribution.

A. G. A. Safety Bulletin—W. T. Rogers, Ebasco Services, Inc., New York, N. Y., chairman. Assembles and edits material for "Safety Trends" section of A. G. A. MONTHLY.

Safety Equipment—J. B. Harris, Arkansas-Louisiana Gas Co., Shreveport, La., chairman. Examines and tests any new safety device in which the gas industry is interested and reports the results of such tests to the general committee so that the information can be released to the industry. Also prepares educational material on use, limitations and care of the safety devices and personal protective equipment items when the need for such material becomes evident.

Accident Recording and Reporting—H. H. Berman, Consolidated Gas Electric Light & Power Co. of Baltimore, Md., chairman. Advises and assists Association headquarters on ways and means of securing information for and setting up the form of the Annual Report of Injuries. Also makes such special studies on accident experience within the gas industry as may be assigned.

Safety Codes and Manuals—A. W. Breeland, Lone Star Gas Co., Dallas, Texas, chairman. Reviews and revises safe practice manuals, codes and other releases relating to safety in the gas industry which are prepared for publication by the National Safety Council or any other agency. Also keeps informed of the work of the American Standards Association and advises the general committee of the preparation or release of any codes or standards which may affect the gas industry.

Safety Education—Prepares monthly Foreman's Letters for release to member company delegates. Also supplies editor of "Safety Trends" section of A. G. A. MONTHLY with educational material for publication.

Safety Posters—P. A. Albert, The Ohio Fuel Gas Co., Columbus, Ohio, chairman. Prepares or assembles poster subject material for development of safety posters.

Health (no standing committee)—

Makes special studies of any health problems submitted for consideration.

Awards—George T. Ruoff, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., chairman. Reviews applications for McCarter Medals, Meritorious awards and million-man-hour awards and recommends action to be taken. Also reviews the record of awards made each year and submits recommendations for changes or revisions in requirements or procedure.

Safety Meetings and Programs—Roy M. Godwin, Philadelphia Electric Co., Philadelphia, Pa., chairman. Schedules any national or regional safety meetings found desirable in the opinion of the general committee, and plans programs of such meetings.

A. G. A. Safety Bulletins

DURING the past year the following bulletins were prepared by the Accident Prevention Committee of the Association:

Review of Fatal Injuries in the Gas Industry During 1939, 1940, 1941.

Report on Welding Gas Lines Under Pressure.

*Accident Experience of the Gas Industry for 1941.

Safety News.

In addition to the above bulletins a series of "Safety Posters of Interest to the Gas Industry" (produced by the National Safety Council) were made available to gas companies as were Foreman's Safety Messages and other important material.

*Prepared in cooperation with the Statistical Department, American Gas Association.

Wanted: Gas Chemists' Handbook

A GAS company member of the American Gas Association is desirous of securing a copy of the Gas Chemists' Handbook, Third Edition, 1929, to add to its library. Anyone wanting to sell this book should get in touch with the Association at 420 Lexington Ave., New York, N. Y. Any reasonable offer will be accepted.

President of Roper Range Corp. Dies

MABON P. ROPER, president of the George D. Roper Corp., and a national figure in the gas range and appliance industry, died December 10.

Mr. Roper's history was closely tied in with that of the Roper organization of which his father George D. Roper was the founder. After his graduation from Cornell University, he entered the employ of the firm, then known as the Eclipse Gas Stove Company. He started from the bottom and rose progressively until he took over the direction of the company upon the death of his father in 1925.

Under Mr. Roper's progressive management the Roper organization made great strides and gained an enviable national reputation. It was one of the first major factories in its area to swing over from peacetime to all-out war production.

Mr. Roper was a member of the American Gas Association, Association of Gas Appliance and Equipment Manufacturers, Illinois Manufacturers Association, and various civic and business organizations.

Manpower Experts Meet in New York



Meeting of A. G. A. Committee on Personnel Practices held in New York, Dec. 11, at which manpower and industrial relations topics were discussed. Left to right, seated: W. N. Bissell, J. D. Dingwell, Jr. (Chairman), Kurwin R. Boyes (Secretary), and F. W. Fisher. Standing: E. F. Hubbard, Arthur R. Laney, Jr., Charles J. Allen, Thomas Loftus, H. H. Ferris, L. M. Ayers, R. I. Marshall, R. D. Roley, M. V. Cousins, A. M. Boyd, H. M. Cook, Gordon M. Peterson, W. E. Himsworth, R. S. Child, and O. S. Hagerman

OWI Broadcasts Gas Conservation Messages

TWENTY radio programs broadcast over the Blue Network, Columbia, Mutual and National Broadcasting Systems, December 14 to 20, incorporated messages on gas conservation supplied by the Office of War Information, Washington. Some of the programs which made use of the announcement included Amos and Andy, Boake Carter, American Forum, Telephone Hour, Mr. District Attorney, Pepper Young's Family and Abie's Irish Rose.

The following is typical of the character of announcement made:

"We wish to call attention to the Government's urgent appeal for the conserva-

tion of gas for cooking and heating. Gas must be conserved for the following reason:

"It is used for fuel by many industrial plants which are now expanded to double and triple their normal peace-time size; it is used widely in the manufacture of armor plate, gun barrels, and similar equipment which must be hardened or molded at extremely high temperatures. Because its flame has fewer impurities than the flame from coal or oil, gas is used almost exclusively in these processes. And gas is, in itself, a raw material for certain products: synthetic rubber for example, and ammonium nitrate which is used in the manufacture of explosives. That is *why*, and here is the *how* of gas conservation:

"Don't use the kitchen range to heat the house. If you heat with gas keep your

house below 65 degrees. Cook at a low blue flame. Use hot water sparingly.

"Those are directions direct from Uncle Sam. The conservation of gas practiced by millions of soldier-citizens on the home front will be echoed in cheers of victory from our fighting men, because the conservation of gas will help give them equipment and weapons they need. By voluntarily reducing your consumption of gas you are helping your country's war production effort. The industrial supply of gas must be kept flowing; war needs must be fully met. If everyone cooperates, government rationing of gas will not be necessary."

Beauty Reads the Gas Meters

Introducing the PUBLIC SERVICE METERETTES



Left to right: THERESA KLESTINEZ, FRANCES ANDREWS, ANN LAMBRECHT, IOLA SMITH, KATHERINE HEINTZ, LOMA DELL FLODQUIST, THERESA CENTANNI, EMMA SPISAK

We are proud to present the Public Service Meterettes—young women who have taken over the responsibilities of meter reading, and in performing a man's job are making another real contribution to the war effort. They have been specially schooled in the function and correct reading of these accurate instruments, and are capable of performing all of the duties of this branch of our service.

Over 260 of our boys thus far have responded to the call of the armed forces and are in active service all over the world—from Alaska to Australia and Iceland to Africa.

Thus these young ladies—"women at war"—are performing a man's task for the duration, doing their part in our Nation's all-out war effort and helping to maintain our high standards of service.



NORTHERN INDIANA *Public Service* COMPANY



This advertisement of the Hammond company and a news story announced that attractive young ladies were taking over the meter reading for the duration. In smart new uniforms, the girls were first schooled in reading and recording both gas and electric meters.

Book on Smoke Offered

THE American Gas Association will gladly donate a copy of the book "Stop That Smoke!" by Henry Obermeyer, published by Harper Brothers, to public libraries at the request and in the name of member companies. Those interested should send names of libraries to the American Gas Association, 420 Lexington Avenue, New York, N. Y. This offer holds good until the limited supply is exhausted.

Private Hargrove Votes for Gas

THE absence of gas fuel in the kitchen of some of the Army camps is causing an extra gripe as well as much mental and physical anguish on the part of some of the harrassed privates on KP duty. At least that conclusion is implied in Chapter 19 of the latest best-seller about Army life, "See Here, Private Hargrove." After a humorous and imaginative description of an encounter with a battery of coal stoves, Private Hargrove made an observation that will gladden the hearts of the gas men. In his own words: "Isn't gas a wonderful fuel?"

Charles W. Hare Dies

CHARLES WILLING HARE, former gas company executive in Philadelphia who after the first World War supervised for the War Department the sale of surplus equipment in Europe for more than one billion dollars, died Dec. 6. He was 71 years old.

Formerly Mr. Hare was head of the new business department of the United Gas Improvement Company. While connected with this firm, he was elected president of the National Commercial Gas Association. At his death, he was managing director and a member of the board of directors of the Bryn Mawr Hospital.

He was a member of an old Philadelphia family, his great-great grandfather, Robert Hare, being the first president of the Pennsylvania Senate, and his great grandfather, Robert Hare Jr., was a noted chemist and inventor of the blowpipe.

Personal AND OTHERWISE

Niagara Hudson Power Elects Schoellkopf

PAUL A. SCHOELLKOPF, vice-chairman of the board of Niagara Hudson Power Corp., has been elected chairman of that organization to succeed the late Floyd L. Carlisle. He has been active in the affairs of the concern or its parent company for 35 years. Since 1929 he has been a member of board and was president from 1929 until 1933, when he became vice-chairman.

Winners of Food Contest Feted in Chicago

FACILITIES of The People's Gas Light and Coke Co., Chicago, Ill., were used for the broadcast over WLS of the national winners of the 4-H Food Preparation contest conducted under the supervision of the National Committee on Boys and Girls Club work and sponsored by Servel, Inc., of Evansville, Ind.

The six young national winners spoke to housewives of the mid-west on Nov. 30, in an interview directed by Mrs. Harriet Hester, of WLS.

The broadcast was from the main floor of The People's Gas Light and Coke Co., and was viewed by scores of customers.



Pictured at the food contest broadcast are, left to right: Louis Ruthenberg, president, Servel, Inc.; F. X. Mettenet, vice-president, The Peoples Gas Light & Coke Co.; Karen Fladoes, director of home service; Bernard H. Wittmann, domestic sales manager; Francis Cowling; and George S. Jones, Jr., vice-president, Servel, Inc.

The young contest winners who spoke over the radio were: Ludell Anderson, 16, Crossroads, N. M.; Phyllis Joyce Coombs, 17, Frankfort, Ind.; Ada Bliss Carter, 21, Tintah, Minn.; Margie Lee Duck, 19, Liberty, Miss.; Pauline Johnson, 17, Ascutney, Vt., and Eileen Reiquam, 17, Collins, Mont.

Each of the national winners was given a \$200.00 college scholarship, presented by Louis Ruthenburg, president of Servel, Inc., at the 4-H club banquet on Dec. 2.

West Named Assistant Managing Director



John W. West, Jr.

He was first engaged in safety activities, which are still under his direction, and subsequently was promoted to the positions of field representative and secretary of the Commercial Section, since known as the Residential Section. His training has been diversified and he is well-equipped to direct the widely varying activities of the Association.

Mr. West is a graduate of the Virginia Polytechnic Institute, Blacksburg, Virginia, where he also took post graduate work and served as an instructor for two years. He performed inspection work for the State Corporation Commission of Virginia, followed by sales of equipment to utilities in Virginia and North Carolina.

Subsequently he was in charge of purchase and measurement of natural and casing head gas in Oklahoma and Texas fields for the Tidal Oil and Gas Company in Tulsa, Oklahoma. In 1920, he returned to Virginia to become chief engineer of the Commission in charge of public utilities. There he was engaged in appraisal, valuation, rate making and servicing activities in connection with telephone, water, street railway, gas and electric utilities.

JOHN W. WEST, JR., secretary of the Residential Section of the American Gas Association, has been appointed assistant managing director of the Association, it was announced December 9 by Alexander Forward, managing director.

Mr. West joined the Association in



Melchett Medal

Melchett Medal Won by Dr. Fieldner



Dr. Fieldner

IN a unique double ceremony, the Melchett Medal for 1942 was presented recently to Dr. Arno C. Fieldner, chief of the Fuels and Explosives Service of the U. S. Bureau of Mines. It was first presented by the Institute of Fuel in England and received on Dr. Fieldner's behalf by Mul-

ford Colebrook of the U. S. Embassy in London. At this time the Melchett Lecture, "The Analysis and Testing of Coal in Relation to Its Properties and Utilization," prepared by Dr. Fieldner, was delivered by means of a talking film which showed the lecturer in action.

Later, on December 2, the medal was presented to Dr. Fieldner by the son of the president of the Institute of Fuel at a meeting of the American Society of Mechanical Engineers in New York.

The Melchett Medal is awarded annually for outstanding achievement in work involving the scientific preparation and use of fuel. Dr. Fieldner is the second American so honored with the medal since it was first awarded in 1930. The only other American to receive it was Charles M. Schwab.

Dr. Fieldner has long been an active member of the Technical Section of the American Gas Association. He and his associates in the Bureau of Mines have made many notable scientific and technical contributions to the gas industry.

Ruthenburg Re-Elected

LOUIS RUTHENBERG, president of Servel, Inc., Evansville, Ind., was re-elected president of the Indiana Chamber of Commerce at the recent annual meeting of that organization in Indianapolis, Ind.



Lieutenant Frances E. Shoup presenting a commission in the WAVES to Gladys Price

Gladys Price Becomes Officer in WAVES

GLADYS PRICE, home service director of the Southern Counties Gas Company, Los Angeles, has been commissioned a Lieutenant, Junior Grade, in women's Naval Reserve. After completing her training at the U.S.N.R. Midshipman's School at Northampton, Mass., Miss Price took up her assignment in Jacksonville, Fla. on December 30.

Miss Price is a past chairman of the Home Service Committee of the American Gas Association and has been prominent in national utility affairs. She had been home service director at Southern Counties since 1933.

Mercedes Bates, formerly home service representative in Hollywood, has been appointed acting home service supervisor to succeed Miss Price for the duration. Both Miss Bates and Miss Price are graduates of Oregon State College.

Edmund Advanced

HARVEY EDMUND has been elected vice president and general manager of Coast Counties Gas and Electric Company, Santa Cruz, California. He was formerly sales manager.

A. G. A. Secretary Joins WAACS

MARGUERITE M. DEL GENIO, an employee of the American Gas Association since June 1936, left November 27 for Des Moines, Iowa, where she is training in the Women's Auxiliary Army Corps. Miss Del Genio was secretary to Frank Williams, assistant secretary of the Residential Section.

Winn Is Major in Army Engineers

JOHNN J. WINN, JR., commercial manager of Portland (Ore.) Gas & Coke Company since 1936 and a member of the Industrial Equipment and Refrigeration committees of the American Gas Association, has received a commission of major in the U. S. Army Corps of Engineers. He is a veteran of World War I.

Major Winn's 28-year career in utility sales and engineering began in 1914 when he joined Stone & Webster and was assigned to its New England properties. Before leaving for the Pacific Northwest he had been with the Consolidated Gas, Electric, Light & Power Company of Baltimore and the Hartford Gas Company.

Always active in American Gas Association work, Major Winn also has been chairman of the industrial section of the New England Gas Association and in the Pacific Coast Gas Association was a member of the Board of Directors and chairman of the Sales Committee.

His early training in engineering was received at Massachusetts Institute of Technology and Johns Hopkins University.



Major Winn

"A. G. A. a Great Help"

A gas company executive, writing November 17 and enclosing a check for his company's membership dues in the American Gas Association, commented as follows:

"We are pleased to inform you that your organization has been of great help to our company during the year ended and hope that our relations will be of a long lasting nature."

Those kind words (and the check) are greatly appreciated.

Lt. Kennedy in Texas

JOHNN KENNEDY, editor of the *A.G.A. Bulletin* published by the national gas equipment manufacturers' association until his induction into the Army last January, is now a second Lieutenant. Mr. Kennedy received his commission in December and is stationed in Texas.

Bainton Leaves A. G. A.

GEORGE BAINTON, an employee of the American Gas Association for the last 12 years, has resigned to accept a position with the Ford Instrument Company, New York City. Mr. Bainton, who was in charge of the A. G. A. storeroom, is employed in a similar capacity by the Ford company.

Oklahoma Utilities Association

J. C. HAPPENNY, president of the Oklahoma Power & Water Co., Sand Springs, Okla., has been elected president of the Oklahoma Utilities Association for 1943. Other new officers are: first vice-president—E. C. Joullian, president, Consolidated Utilities Corp., Oklahoma City; second vice-president—George McLean, Oklahoma Gas and Electric Corp., Oklahoma City; treasurer—D. S. Kennedy, treasurer, Oklahoma Gas and Electric Co., Oklahoma City.

CONVENTION CALENDAR

JANUARY

Jan. 14-15 American Management Association Marketing Conference
Drake Hotel, Chicago, Ill.

FEBRUARY

Feb. 10-12 American Management Association Personnel Conference
Palmer House, Chicago, Ill.

15-18 American Institute of Mining and Metallurgical Engineers, Annual Meeting
New York, N. Y.

MARCH

Mar. 11-12 A. G. A. Industrial and Commercial Gas Conference
Hotel Statler, Detroit, Mich.

MAY

Week of
May 17 National Fire Protection Association
Chicago, Ill.

Canadian Gas Association

FALLING in line with the Canadian Government's expressed wish that conventions and conferences be withheld for the duration of the war, the Canadian Gas Association has decided to forgo its 36th annual convention slated for Niagara Falls, Ontario, June 3 and 4.

The Canadian Gas Association's laboratory approvals division, following the procedure recently adopted by the American Gas Association, has discontinued the issuance of the regular Directory of Approved Appliances and Listed Accessories for the duration.



Accounting SECTION

L. A. MAYO, *Chairman*
O. H. RITENOUR, *Vice-Chairman*
O. W. BREWER, *Secretary*

How Girl Meter Readers Are Helping in the War Effort

By C. E. JOHANSEN

Atlanta Gas Light Co., Atlanta, Ga.

HALF of our meter reading force now consists of girls—ten men and ten girls. We have been building up our personnel with girls since about April 1. Our start along this line was prompted by the heavy turnover of men in the Meter Reading Department.

Up until the time we started using girls, our meter reading force also delivered bills. We usually employed a young man to deliver bills with the thought in mind that we would make a meter reader of him after about five or six months. Because of the fact that the men were generally young and without dependents, most of them were subject to military service and we found that the turnover in this department was entirely too heavy.

First, we started the girls off with one of the older, experienced meter readers and our first mistake was in permitting them to work too long hours at the beginning, the result being that they were forced to take time off because of inability to keep pace with the men meter readers. After recognizing this trouble, we decided that the girls should be permitted to start out on about a three-hour day, increasing this as they were able to stand more walking. After a girl finished her training for the day, she usually reported back to the office and was used on various detail jobs—principally the stuffing of bills and advertising matter in envelopes for mailing.

Rate of Pay

The girls are paid at a standing starting rate and at the end of two months they are automatically raised \$5.00 per month, this amount being considered as an allowance on the payment of uniforms. As they become more capable in their work, they are granted additional increases.

Practically all meters in Atlanta are in basements or under the houses which makes reading difficult. The girls, being new on the job, are questioned considerably by customers although most are very friendly, their questioning being merely an expression of interest.

No notice of the change to girl meter readers was given to the customers through advertising in the local papers or with bill stuffers and, of course, that is one of the things that prompted a great deal of the questioning by customers. Some months

after we started this practice, there were newspaper stories dealing with the use of girl meter readers as a part of our help in the war effort. We feel that as a result of this it has been easier for us to secure girls for this class of work.

Only a few objections by customers to girls reading their meters have been received to date and after talking with them they are usually satisfied. Only one known objector exists and this customer's route sheet has been marked so that the meter will be read by the Skip Reader.

The girls employed do not have to have any particular type of experience, however, we usually insist on high school education.

We have made comparisons of the work being performed by the men and the girls and do admit that the men have been able to read more meters per hour than the girls. On the routes which we used for comparative purposes, the men averaged

reading 30 meters per hour while the girls read 24. The girls are as accurate as the men but, as a rule, have not traversed the same territory twice and naturally do not know the territory nor the easiest way to get to the meter locations. We do feel that the average number of meters read will increase as the girls become more familiar with the territory to be worked.

One other feature regarding the girls is the fact that they have more skips than the men, probably because of the fact that they are a little more hesitant about going into a basement without permission of the customer while it is felt that the men are more willing to take chances on reading a meter if it is possible to do so. This, of course, accounts for more skip meters on the girls' part to be followed by the Skip Meter Readers.

Our meter readers work five days a week and 7½ hours a day. In many cases, it takes longer than this to read a book and they are authorized to stay on the route until it can be read if it does not involve too much overtime, which would cause inconvenience to the customer. They are



Girl meter readers "take over" in the Atlanta Gas Light Company

Presented at A. G. A. Annual Meeting, Chicago, Ill., October 5-6, 1942.

paid for all hours in excess of 40 hours a week at the rate of time and one-half.

Our experience with the girls has also been that they are off on account of sickness more than the men.

The girls are required to do their own subtracting of the meter readings and make their own skip reading slips for following by the Skip Meter Reader.

So far, we have been able to assign men to the business districts and to the less desirable residential sections, but should the number of men meter readers decrease, we will not have any hesitancy in assigning girls to these territories and feel that they will be thoroughly capable of taking care of their duties.

It has been our policy in the past to employ single women only for this and other types of clerical work; however, because of existing conditions this rule will probably be amended to permit employment of married women within a very short time.

There are no regulations by the State prohibiting employment of women as meter readers.

A summer uniform was selected for the girls and consisted of a type of overall worn with a white silk shirt. While we have not yet received the winter uniforms, they have been selected and consist of a slack suit made of navy blue denim with a jacket to match. A trench type cap is worn with both the summer and winter uniforms. The girls all carry identification cards and also wear the Blue Flame emblem on their uniforms.

N.A.R.U.C. Reports

THE National Association of Railroad and Utilities Commissioners has prepared the following printed copies of reports presented at their St. Louis Convention, which may be secured from that body at 7411 New Post Office Building, Washington, D. C.:

Report of Committee on Accounts and Statistics.....	\$1.00
Accounting Procedures Requiring Commission Approval.....	1.00
Interpretations of Uniform System of Accounts for Gas Utilities, Bulletins G-1 to G-5 consolidated into one document.....	1.00
or any one of the five Bulletins each25
Rules Governing Preservation of Records of Gas Utilities.....	.50
Interpretations of Rules Governing Preservation of Records of Gas Utilities25
"Does the Decision in the Natural Gas Pipeline Company Case Lay the Ghost of Smyth v. Ames?" address by General Solicitor Benton.	1.00
"Relations between State Regulatory Agencies and the Federal War Agencies," address by Herbert S.	

Marks, Chief of the Power Branch of the WPB.....	.75
Report of the Committee on Rates of Public Utilities.....	.50
Report of the Committee on Valuation50
Progress in Public Utility Regulation	1.00
Uniform Power Factor Clauses in Electrical Rate Schedules, and Fuel Adjustment Clauses in Utility Rate Schedules, by Professor McNamara75

Washington Gas Supply Stepped Up

COMPLETION by January 1, 1943, of a second natural gas pipeline from Rockville, Md., into the District of Columbia was predicted recently by an official of the Washington Gas Light Company.

The line, costing \$800,000 to install, will bring into Washington half again as much natural gas as the original line which has met requirements for the past 10 years. Gas users in that area are served a mixture of natural and manufactured gas. When the new line is placed in operation the supply will be stepped up to a point never before attained in the company's history.

SYNTHETIC PRODUCTS FROM NATURAL GAS

(Continued from page 22)

thirty-five miles an hour. This will naturally be improved upon.

Another type of synthetic rubber is the acrylonitrile-butadiene which can be produced also from natural gas and is known as Buna-N or Perbunan.

One of the necessary materials in the compounding of either natural or synthetic rubber is carbon black which is made from natural gas. Carbon black is an important component in tires or other rubber goods whether it is blended with natural or synthetic rubber, as the properties of rubber, particularly from the standpoint of the tensile strength and wearing qualities under service conditions, are greatly improved. During the year 1940 about 369 billion cubic feet of natural gas were converted, largely by the channel process (air oxidation), into carbon black with an average of 1.54 pounds per cubic foot of gas or about 285,000 tons, of which about eighty-five per cent was used in tires. Furnace black appears to be superior for use in synthetic rubber.

Service Charges

THE Milwaukee Gas Light Company has been granted permission by the Office of Price Administration to increase its charges for some services. Under the new schedule, free time for work done by the utility servicemen will be limited to 15 minutes. Traveling time is covered by a flat increase in rate. Old rates provided for eight minutes of travel to the job and 22 minutes of service time before any charge was made to the customer.

The change in charges affects both services performed on a customer's premises at his request and regularly scheduled maintenance service provided under contract. No change was allowed in charges for services supplied in maintenance and repair of gas furnaces, unit heaters and water heaters.

WELL, IT WAS AN IDEA

Gas has been accused of a new defect—that of causing insobriety. When a man was charged at Hamilton on a charge of being in a state of intoxication in a public omnibus, he pleaded that his condition was not due entirely to drink, but to sulphur fumes and gas as he worked in a gasworks. His plea was unsuccessful.

—The Gas World, London.

The world's natural rubber production for 1941 was about 1,675,000 into nitric acid. Combination of the long tons of which the U. S. imported over 800,000 long tons. The United Nations have lost over 95 per cent of the world's natural rubber sources and Russia has lost two of its synthetic rubber plants in the Ukraine.

The synthetic rubber picture in the U. S., with its 886,000 tons a year at plant costs of about \$800,000,000 are already well under way. As far as the author is concerned, synthetic rubber in the United States is here to stay and will be a permanent industry during the next peace period. It can be stated that synthetic rubber in mass production will cost less than 15 cents a pound.

Does this mean that natural rubber will not have its uses? As far as tires are concerned, it will not have the dominating position it has held heretofore. One may be certain that as good as synthetic rubber is today, it will be far surpassed by that yet to come.

(To be concluded in February)



Residential SECTION

B. A. SEIPLE, *Chairman*
C. V. SORENSON, *Vice-Chairman*
J. W. WEST, JR., *Secretary*

Sales Executives Report on War Work in Nutrition and Conservation



A. H. Palmatier

Power Company, Nyack, N. Y. Sponsored by the Residential Section of the American Gas Association, the meeting provoked unrestrained comment on such vital topics as: nutrition, conservation, maintaining customer contacts, service, research and post-war markets. It was attended by 35 sales executives representing gas utilities from the Eastern seaboard.

Industrial Nutrition Plan

Leading off the discussion, R. A. Malony, sales manager, Bridgeport Gas Light Company, Bridgeport, Conn., reviewed the progress of the nationally known Industrial Nutrition Program which was described fully in an article in the May issue of the *A. G. A. MONTHLY*. He attributed a large part of the success of the program to the cooperation of the local press but pointed out that conditions in Bridgeport might not be typical of other territories. The entire population in that area, he stated, is engaged in some type of war work; 70% of the workers carry lunches, 10% eat in local restaurants, and 20% obtain their food in commissaries of local plants and manufacturing organizations. Mr. Malony cited the great interest of local organizations in the subject of food and nutrition as evidenced by the large sums of money being spent by such organizations to determine the most nutritious food which should be consumed by their employees.

A physician sent by the National Research Group is stationed at Bridgeport investigating and analyzing food habits of factory employees. Many factories are now employing qualified nutritionists to conduct this work. Mr. Malony commented on the successful use of women who had no previous dietetic experience but who were specially trained by the gas company in presenting lunch-box demonstrations to

women's clubs. He discussed the lunch-box folders prepared by the gas company for use in the campaign and stated that a total of more than twice the number of their meters have been distributed throughout the city. Mr. Malony added that the restaurant program has recently gotten under way, and the interest shown by the local restaurant owners indicates that it will be very successful.

He also pointed out that the gas company cooperates closely with the Office of Defense, Health and Welfare, the Red Cross and other war activities and that their home service department is diligently engaged in taking care of inquiries received from those and other organizations. He went on to say that gas company employees are members of the most important local boards now conducting war activities in the Bridgeport area. Regarding the direct benefits of the program which accrue to the gas company, Mr. Malony stated that in his opinion this effort will result in better press relations, the creation of local good will toward the gas company by the consumer and other intangible benefits. A survey involving 1,000 persons is now being taken in an effort to evaluate public reaction to the program.

Rochester Program

Progress of the Rochester Gas and Electric Corporation in promoting the national nutrition program in Rochester was summarized by F. M. Houston, sales manager of that company, who also outlined the gas and equipment conservation steps being taken in that territory. This utility is co-operating closely with the local medical profession, the Industrial Management Council, the National Association of Manufacturers and others, and has received a large number of requests from local organizations for information.

The popular "Food for Fitness" campaign of the Public Service Electric and Gas Co., Newark, N. J., was described in detail by James P. Hanlan, sales manager. This program was covered fully in an article in the last issue of the *A. G. A. MONTHLY*.

Further developing the subject of "Maintaining Customer Contacts," W. J. Schmidt, general sales manager, Long Island Lighting Co., Mineola, L. I., N. Y., disclosed methods utilized by his organization to keep the value of utility service before the

public. These included the preparation and mailing of leaflets and advertisements on blackout and dimout regulations, folders on appliance maintenance and care, and pamphlets providing food and nutrition information.

Mr. Schmidt described how home service representatives of the company are being trained to clean and relight range pilots, make burner adjustments and minor repairs, in addition to giving instructions to the housewife. This plan is designed to reduce customer service calls and avoid delays resulting from the manpower shortage. Representatives of the Long Island company also contact customers and discuss insulation, storm windows and other heat-saving devices.

Post-War Demand

As evidence of the tremendous post-war demand for durable merchandise, Mr. Schmidt presented a study of recent U. S. Chamber of Commerce surveys relating to the market for automobiles, mechanical refrigerators, stoves, washing machines, and other appliances. He concluded that it may be necessary for the gas industry to revise its existing sales technique, advertising and sales policies in the post-war era in order to keep abreast of the intensive competition which is forecast for that period.

R. E. Williams, new business manager, Binghamton Gas Works, Binghamton, N. Y., said that one of the best ways of maintaining customer contacts is to inform the customer what the gas industry is doing in the war effort. He pointed out how his company is devoting special advertisements to WPB orders and other war activities, and is offering customers much information on the conservation of their gas appliances. He emphasized the importance of cooperating wholeheartedly in the nutrition program without attempting to promote gas sales at the same time.

Other activities of the Binghamton company outlined by Mr. Williams include close cooperation with all local committees, the use of visual displays on sales floors, gas bill stuffers set up in such a way that they can be filed, card files containing food and nutrition data, and patriotic advertisements with sales stories subordinated. Close cooperation with local schools, churches, girl scouts and similar organizations was advocated.

Injecting the service problem into the

discussion, W. S. Potter, vice-president, Elizabethtown Consolidated Gas Co., Elizabethtown, N. J., described the program undertaken by his company to educate the public concerning the many new problems resulting from manpower and material shortages. It was his opinion that customer reaction would be favorable if customers were kept fully advised of all factors. He also spoke of the important work carried on by the home service department which actively cooperated with the Red Cross, girl scouts, and similar groups. He referred particularly to the fine public reaction to the introduction of the company's mobile emergency kitchen unit. (See A. G. A. MONTHLY, page 90, March 1942.)

James A. Sackett, sales manager, Kings County Lighting Co., Brooklyn, N. Y., told how former appliance salesmen have been retained to conduct a survey among consumers to determine the type, age, appearance and operating condition of gas appliances. Each appliance is distinguished by a different color card, thus making it comparatively simple to classify each particular appliance. These representatives make sales where possible under the various limitation orders and assist the consumer in the conservation of their appliances.

A. G. A. Research

Turning to wartime research, Eugene D. Milener, secretary Industrial and Commercial Gas Section, A. G. A., summarized the accomplishments and program of the American Gas Association in the domestic gas field. He explained that as a result of an understanding with the appliance manufacturers the domestic gas research activities of the Association are limited to fundamental research; the manufacturers agreeing to devote their research and development activities to gas appliance design, efficiency, appearance, etc. The Domestic Gas Research Committee has directed and will continue to direct fundamental research in the standard home uses of gas, including cooking, water heating, direct space heating, central space heating, and air conditioning. Important research in the fundamentals of atmospheric gas burner design has also been undertaken, Mr. Milener reported.

In closing Mr. Milener suggested that the sales managers group make a study of the "non-research" features of gas appliances that would be needed to meet the post-war market, in other words to give the appliances "a going over with a CP fine-tooth comb." He predicted that the team of fundamental, technical research and thorough "non-research" analysis would make the post-war gas appliances unbeatable.

Leading the post-war planning section of the forum, C. V. Sorenson, new business manager, Midland Utilities Co., Hammond, Ind., and vice-chairman, Residential Section, presented a valuable blueprint for post-war operation. Mr. Sorenson's views on this subject were presented fully in an article in the November, 1942, A. G. A. MONTHLY

entitled "Planning and Preparing for Post-War Sales."

Mr. Sorenson pointed out that one of the critical questions which the gas company will have to solve will be to estimate the amount of gas load it will lose when the war ends and determine the amount of new load in terms of revenue which will be required to maintain the company's net position. This can be accomplished by an analysis of the classes of business being served and where new business may be located. Mr. Sorenson high-lighted this point by reviewing the position of several companies operating in his group based on setting up a potential saturation point in the residential market on gas for the Four Big Jobs giving the ratios of increased gas loads which could be obtained therefrom and its effect on the company's position in the post-war era.

During general discussion that followed, George F. B. Owens, The Brooklyn Union Gas Company, stated that he thoroughly agreed with Mr. Sorenson and that gas companies must analyze their cost and pricing methods to increase business. He stressed the importance of surveys for use

in the post-war era and pointed out that the New Business Department is a vital factor in gas company operation.

Charles A. Tattersall, vice-president, Niagara Hudson Power Corp., New York, and chairman, A. G. A. Committee on Publicity and Advertising, led the discussion of the National Gas Conservation Program, paying particular attention to advertising phases of the program. After presenting the background of the WPB conservation and curtailment movement, Mr. Tattersall exhibited the complete conservation campaign prepared by the A. G. A. committee in support of the program. Details of this campaign together with representative gas company conservation advertisements were presented in the December A. G. A. MONTHLY.

During the general discussion which followed, Mr. Malony explained the block plan now being put into effect in Bridgeport to conserve gas. This plan is based on having women contact their friends requesting them not to use gas on cold days for baking and to avoid using gas ranges for heating purposes.

Utilities Help Fat Salvage Drive

PUBLIC utilities have added to their war efforts a big push for the drive to salvage waste cooking fats. Housewives instinctively look to their local gas companies for cooking guidance, so there is a natural tie-up between utility displays and home service activities and the national effort which is being made to conserve waste fats for use in explosives. From these fats comes glycerine, the precious fluid that is basic in the manufacture not only of gunpowder and dynamite but also of many other necessary war products. That is why the War Production Board has called upon American housewives to save and turn in some 500,000,000 pounds of waste kitchen fats per year.

Many companies are mentioning fat salvage in their newspaper advertising and in envelope stuffers mailed out with monthly bills. Window display is another effective medium. Using a few simple "props"—such as a frying pan, a wire strainer and a wide-mouth container—tied in with a cooking range or refrigerator, an effective display is easy to set up. A four-color poster showing how waste cooking fats are needed in firing field guns can be obtained without charge from the Waste Fat Saving Committee of the Glycerine and Allied Industries, 11 West 42nd Street, New York. The committee can also supply mats for envelope stuffers, copy ideas for newspaper publicity and advertising and factual material for the home service department.



One of 30 Waste Fat Saving window displays set up by the Public Service Electric & Gas Company, Newark, N. J. It was designed by George W. Browne, assistant display director, who is the newly appointed chairman of the A. G. A. Window and Store Display Committee



Industrial & Commercial Gas SECTION

B. H. GARDNER, *Chairman*
CHARLES G. YOUNG, *Vice-Chairman*
EUGENE D. MILENER, *Secretary*

Men and Affairs of Important Industrial and Commercial Gas Committees

Metal Treating and Melting



John P. Brosius

THE Metals Treating and Melting Committee is concentrating on two main studies this year. One subcommittee is making a thorough investigation of the present and probable future status of gas in the fast developing art of furnaceless heating. Subcommittee for Assignment No.

1 is continuing its studies of heat treatment of aluminum and magnesium. The excellent report of this subcommittee issued in September has been very well received throughout the gas industry and in metallurgical circles, and is already being put to wide use by those engaged in working these increasingly important light metals.

Many people believe that the next big and important movement in industrial heating of metals will be "furnaceless" heating. In fact, this movement is well under way for both gas and other fuels and was first discussed at the A. G. A. Industrial Gas Conference in 1940. A complete analysis of this subject is being made by Subcommittee for Assignment No. 2, F. W. Marklin, chairman, and it is expected that the basis for an aggressive course of action by the gas industry will result.

Other matters being handled by the Metal Treating & Melting Group are:

Assignment No. 3

Develop plan to assist in placing modern and suitable gas metal treating and melting equipment in schools and colleges.

Assignment No. 4

Make recommendations to Committee on Industrial Gas Research for specific research work in the metals field.

Assignment No. 5

Prepare and present not less than two papers at A. G. A. Industrial and Commercial Gas Conference, which will be held in Detroit, Michigan, March 11 and 12.

Assignment No. 6

Prepare interesting and instructive articles for publication in gas magazines on the use of gas for metal treating and melting in war production.

Assignment No. 7

Sponsor paper at 1943 National Metal Congress.

The chairman of this important committee, John P. Brosius, comes from the center of the steel industry of the United States. He is general industrial utilization engineer of Equitable Gas Company, Pittsburgh, Pa.

Mr. Brosius' early business experience was in the electrical industry. Graduating with the degree of B.S. in Electro-Chemical Engineering from Penn State College, he

became associated with General Electric Company at Schenectady, N. Y., following which he carried on special metallurgical work for Blaw-Knox Company at Blawnox, Pa. Later he entered the gas business as an engineer in the Industrial Gas Engineering Department of Equitable Gas Company. His advancement was rapid to his present post of general industrial utilization engineer for that progressive company.

Mr. Brosius has worked with many large and small manufacturing concerns to assist them in developing new and more efficient methods of using industrial gas in their production processes. He believes that, despite the great extension of gas as a modern process fuel in American and Canadian factories, there are large potential markets of a profitable character waiting to be opened after the war. He also is a firm believer in the value of good industrial gas

(Continued on page 43)

Industrial and Commercial Space Heating



Henry O. Loebell

THE Committee on Industrial and Commercial Space Heating is making a thorough study of load factors of the various types of industrial and commercial space heating loads. Preliminary studies made by the committee indicate that the usual basis on which load factors

are figured hold for conventional heating installations such as dwellings, but that they are open to serious question when applied to shorter hours of heating, lower daytime temperatures, etc.

A method has been worked out whereby load factors can be figured in ways that will take into account the special characteristics of most industrial and commercial heating loads. Members of the committee and a few others are making check tests in their home cities in order to better evaluate the method.

Henry O. Loebell, who is consultant for Natural Gas Pipeline Co. of America, Gas

Advisers Inc., and Surface Combustion, is chairman of the committee. He has worked energetically in the development of the method which is the basis of the committee's present studies. Mr. Loebell is an experienced committee executive with a wide background in the gas industry. In 1934 he received the Charles A. Munroe Award and at present is carrying on war work as head consultant on gas industries, Office of Civilian Supply Services, Programs Branch, Fuel and Power Section, War Production Board, with offices in New York and Washington.

Serving with Mr. Loebell on this committee are: George L. Ballard, Panhandle Eastern Pipe Line Co., Detroit, Michigan; Robin A. Bell, Surface Combustion, New York, N. Y.; C. L. Benn, Equitable Gas Co., Pittsburgh, Pa.; W. N. Blinks, General Gas Light Co., Kalamazoo, Mich.; J. N. Crawford, The Bryant Heater Co., Cleveland, Ohio; Nelson R. Gorsuch, Citizens Gas and Coke Utility, Indianapolis, Ind.; S. B. Lee, National Utility Co. of Michigan, Benton Harbor, Mich.; R. H. Lind, Iowa-Illinois Gas and Electric Co., Davenport, Iowa; and E. H. Ronsick, The St. Louis County Gas Co., Webster Groves, Mo.

Food Service Equipment



Roy E. Wright

THE Food Service Equipment Committee is following up a number of matters in connection with the use of gas in Army and Navy establishments, as well as problems which concern quantity cookery equipment

in war production plant cafeterias.

Also, the committee is looking toward the future and studying some basic trends which are becoming evident in the quantity cookery and baking fields. This involves not only equipment but other phases of hotel and restaurant kitchen operation which vitally affect gas.

The food service equipment field embraces a large number of totally different appliances, each of which present individual problems.

Roy E. Wright, chairman, Food Service

Equipment Committee of the Industrial and Commercial Gas Section, is a veteran gas man, trained in the Doherty school for cadet engineers, who carried on gas engineering work in Toledo, Ohio, and Washington, Pa. His utilization experience was gained with Surface Combustion, New York State Electric & Gas Corporation, and with the Associated System in New England.

Mr. Wright is now manager of gas sales, for New England Gas & Electric System, with headquarters in Cambridge, Mass. For some time he has been a student of commercial gas appliances, their sale and performance, and he is well known not only to industrial and commercial gas men, but also in hotel and restaurant supply circles. He is a native of Troy, New York, and was educated at Troy High School and Rensselaer Polytechnic Institute, having been captain of the football team at both institutions.

Mr. Wright has retained his robust characteristics, which were apparent in college days, and brings to the Food Service Equipment Committee an unusual supply of energy backed by sound ability and broad experience.

ditioning for the large Public Service system. This system serves one of the most highly industrialized areas in the country, an area in which almost everything is manufactured. This great diversity has given him full opportunity to exercise his abilities, and he has organized one of the largest industrial and commercial gas forces in the country. His interest and belief in national advertising of industrial and commercial gas have always been intense, and he has been active in the Industrial and Commercial Gas Section's magazine advertising since before the present general committee on national advertising came into existence.

F. B. Jones, general sales manager of Equitable Gas Company, Pittsburgh, Penna., is vice-chairman of the committee. Mr. Jones is an experienced industrial gas engineer in addition to being a top flight sales executive and a student of public utility advertising. He is a past chairman of the Industrial and Commercial Gas Section.

Our Own John Paul Jones Enters Navy

IN a recent issue of the rotogravure section of the Sunday *Baltimore Sun*, a full page was devoted to the commissioning in the Navy of Lt. John Paul Jones, an industrial gas engineer of Consolidated Gas Electric Light & Power Company. Pointing out that his illustrious name naturally would cause him to lean toward the Navy, pictures were shown of his family life, his work in the industrial and commercial gas field, filling out his papers, his physical examination, and receiving his commission.

Mr. Jones will be remembered by industrial and commercial gas men for the original paper he gave at the 1941 Industrial and Commercial Gas Conference entitled "Application of Gas to New Type Air Conditioned Smoke Hams."

Industrial and Commercial Gas Advertising



J. P. Leinroth

THE Association's industrial and commercial gas advertising has been geared to the use of gas in the war effort since the beginning of hostilities. The committee and the agency are constantly strengthening the copy that is built around this theme and the advantages of gas are being

driven home through the media of the business and technical press. The committee believes that in addition to assisting in war production and in properly preparing food for the armed forces and war workers, this advertising is building an acceptance for industrial and commercial gas that will extend over into the post-war period. A. G. A. industrial and commercial gas advertisements are currently appearing in the following business and technical magazines:

Iron Age
Steel
Metals and Alloys
Metal Progress
Heat Treating and Forging
Bakers Weekly
Ceramic Industry
Glass Industry

American Restaurant
Hotel Management
Modern Hospital
Chain Store Age
(Fountain & Restaurant Sec.)
Business Week
Industrial Heating

The chairman of the National Advertising Committee of the Industrial and Commercial Gas Section is J. P. Leinroth, general industrial fuel representative, Public Service Electric and Gas Company, in Newark, New Jersey. After graduating from Cornell University, Mr. Leinroth returned to his native Philadelphia as cadet engineer with United Gas Improvement Company where he became thoroughly grounded in the gas business. From 1916 to 1922 he further rounded out his industrial and engineering experience specializing in welding, first as research and development engineer with Oxyweld Acetylene Company, then as superintendent of welding at the Bossert Company, Utica, New York. In the latter position he directed one of the largest welding shops in the country at that time. This practical experience was topped by two years on the engineering faculty of the University of Illinois.

In 1922 Mr. Leinroth took up his present work which covers supervision of industrial gas, commercial gas and electricity, gas house heating and gas and electric air con-

Gas Furnace Standards

STANDARD minimum specifications for gas floor furnaces of the gravity circulating type have been approved by the American Standards Association (Commercial Standard CS99-42). With the latest American Standard Approval Requirements for Central Heating Gas Appliances (ASA: Z21.13-1940) as basic prerequisites, this standard covers construction and installation requirements for gravity circulating type gas floor furnaces, including those having single or dual wall register outlets, for use with natural, manufactured, mixed and liquefied petroleum gases.

The new standard, which was developed by the National Bureau of Standards includes the sizing, placement, general installation requirements, venting, gas connections and methods of certifying compliance with the standard.

Serving on All Fronts

AMONG the Industrial and Commercial gas men serving in the armed forces are the following:

- A. M. Apmann, Captain
Derby Gas & Electric Co., Derby, Conn.
1st Training Base, Co. "B," Camp Ritchie, Md.
- William K. Beard, Lt. Comdr.
The Philadelphia Gas Works Co., Philadelphia, Pa. U. S. N. R., U. S. Naval Base, Cape May, N. J.
- Julian E. Clark, Lieutenant
Atlanta Gas Light Co., Atlanta, Ga.
Corps of Engineers, 1018 Christopher Ave., Gadsden, Ala.
- J. E. Coleman, Captain
The Manufacturers Light & Heat Co., Beaver Falls, Pa. Fuel Control Sec., Pittsburgh Ordnance Dist., 1202 Chamber of Commerce Bldg., Pittsburgh, Pa.
- J. M. Cox, Jr., Lt. Comdr.
Southern California Gas Co., San Bernardino, Calif. c/o Comdt. 11th Naval Dist., San Diego, Calif.
- B. P. Dahlstrom, Lieutenant
Public Service Electric & Gas Co., Newark, N. J., U. S. N. R., Washington, D. C.
- R. L. Davis, Major
Consolidated Gas Elec. Lt. & Pr. Co., of Baltimore. Ordnance Dept., Milwaukee Ordnance Plant, Milwaukee, Wis.
- Fred Dietrich
Pacific Gas & Electric Co., San Francisco, Calif.

- W. W. Fitkin, Captain
Southern Counties Gas Co., Santa Barbara, Calif. Fort Winfield Scott, Santa Francisco, Calif.
- Robert L. Gifford, Lt. Comdr.
Blackstone Valley Gas & Electric Co., Pawtucket, R. I.
- John E. Gross, Lieutenant
Public Service Electric & Gas Co., Orange, N. J. 13th Pursuit Squadron, Dale Mabry Field, Tallahassee, Fla.
- John P. Hanson, Public Service Electric and Gas Co., Trenton, N. J. 307 Technical School Squadron, Flight 1-C, Keesler Field, Miss.
- Charles C. Hanthorn
The Philadelphia Gas Works Co., Philadelphia, Pa.
- F. B. Hatcher, Lt. Second Class
Washington, D. C. U. S. N. R.
- F. Harvey Holden, Colonel
Southern California Gas Co., Los Angeles, Calif. Fort Stevens, Oregon
- Louis H. Hungate, Jr., Captain
Louisiana Power & Light Co., New Orleans, La. 2809 Naylor Road, S. E., Washington, D. C.
- H. Stuart Johnston, Captain
Florida Public Service Co., Orlando, Fla.
- J. Paul Jones, Lieutenant
Consolidated Gas Elec. Lt. & Pr. Co. of Baltimore, Baltimore, Md. U. S. N. R.

(Continued on page 43)

INDUSTRIAL AND COMMERCIAL GAS ADVERTISING FOR JANUARY

The National Advertising Committee of the Industrial and Commercial Gas Section, J. P. Leinroth, chairman, and F. B. Jones, vice-chairman, announces that full page advertisements will appear in the trade and business magazines listed below during the month of January. These advertisements are prepared in cooperation with the Committee on National Advertising as a part of the industry's national advertising campaign.

MAGAZINE

THEME

General Manufacturing

BUSINESS WEEK (Jan. 23— $\frac{2}{3}$ page) Victory could depend on this one bolt!

Metals Industry

STEEL (Jan. 18)
INDUSTRIAL HEATING
METAL PROGRESS
HEAT TREATING AND FORGING

IF the parts are right . . . weapons will fire accurately . . . and that's where GAS fits in.

Baking Field

BAKERS WEEKLY (Jan. 25)

The world's biggest "restaurant chain" . . . uses GAS for baking.

Ceramic Industry

CERAMIC INDUSTRY

Where would this bomber be without Ceramics and GAS?

Commercial Cooking Field

AMERICAN RESTAURANT

To launch ships *Faster* calls for nutritious food! That calls for GAS and the best GAS cooking equipment.

CHAIN STORE AGE (Fountain and Restaurant Section)

Behind the Army's "Master Menu" . . . GAS for cooking and baking.

GAS AT WORK



Gas cooks for the Navy—The Great Lakes Naval Training Station in Illinois, the world's largest, trains cooks in one of its numerous special schools. Its culinary course includes instruction and practical experience in roasting, frying, kettle cooking and steam pressure cooking, principally on gas ranges.

One way of saving gasoline—Gas is used in the manufacture of horse shoes. Amid the greatest mechanized war in history shoe production for America's 12,000,000 horses is twice that of recent years—and still going up.

R. L. McCuen, Duke Power Company, has been elected President of Mid-Southeastern Gas Association. He is an expert in the gas commercial cooking field. Congratulations!

Girls in war plants are now getting the benefit of data and layouts presented in the Volume Water Heating Committee's report on factory washrooms. It's another development in a new field.

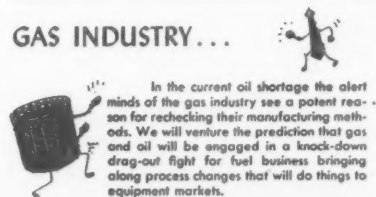
The Philadelphia Gas Works Company has a splendid series of window displays which show gas as an important factor in production for war. Under the heading "Gas Speeds Victory to the United Nations," each window has a large red arrow pointing to an important tool of war. One window points toward a model tank, another to a warship and others show airplanes, merchant vessels, etc. In each window flags of all the United Nations are shown.

Caterpillar Tractor Company's employee cafeteria in Peoria, Illinois recently bought 15 head of beef at one time. Good food means good health and these war workers are getting lots of it cooked over a gas flame.

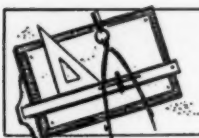
Forced convection heating with gas is now being applied at temperatures of 1750°, a far cry from the low temperature limitations of just a few years ago.

Applications of gas pot furnaces to additional heat treating processes is rapidly advancing. One bath manufacturer has just announced ten new uses for pot furnaces.

GAS INDUSTRY...



Reproduced from Industrial and Engineering Chemistry advertisement



Technical SECTION

HAROLD L. GAIDRY, *Chairman*
CHARLES F. TURNER, *Vice-Chairman*
A. GORDON KING, *Secretary*

Technical Section Holds Organization Meetings

TECHNICAL support for the war effort in so far as the gas industry is concerned will be forthcoming in even greater measure during the next year than in the past strenuous months, it was indicated at the organization meetings of the Technical Section, American Gas Association, held December 8 and 9 in New York City. Under the able leadership of Harold L. Gaidry, of New Orleans, chairman, and Charles F. Turner, of Cleveland, vice-chairman, these meetings were held to perfect an efficient and far-reaching war program.

In addition to the Section's Managing Committee, which met December 9 with the largest attendance in its recent history, the following committees and their subcommittees met: Chemical Committee, T. L. Robey, chairman, V. J. Altieri, vice-chairman; Distribution Committee, H. B. Andersen, chairman, A. C. Cherry, vice-chairman; Gas Conditioning Committee, H. D. Lehman, chairman, Dr. E. W. Guernsey, vice-chairman; Gas Production Committee, E. W. Zimmerman, chairman, F. J. Pfluke, vice-chairman; Motor Vehicles Committee, Linn Edsall, chairman, E. W. Jahn, vice-chairman.

War Program Projected

As the wheelhorses of the gas industry's operating divisions, these committees laid down the framework of a program to maintain the flow of gas to war industries at top efficiency despite material and manpower shortages, raw material substitutions, and other war problems.

Participating in the deliberations and offering their valuable experience and advice were A. G. A. President Arthur F. Bridge; W. Cullen Morris, chairman of the National Technological Civil Protection Committee; H. C. Cooper, longtime chairman of the Natural Gas Section's Main Technical and Research Committee, and Munroe Award winner; E. J. Tucker, general manager of the Consumers Gas Company of Toronto, Ontario; Dr. F. H. Dotterweich, consultant for natural gas and natural gasoline, Office of Petroleum Administration for War; Past Technical Section Chairman F. M. Goodwin; and A. G. A. Managing Director Alexander Forward.

In view of the fast-breaking developments and increasing changes in operating procedure as a result of the war, it was decided to hold Spring conferences of the Distribution, Production and Chemical, and Motor Vehicle groups if war transportation and other factors permit.

Following is a brief outline of committee

activities as reported at the Managing Committee meeting:

Gas Production

Reporting for this committee, Mr. Zimmerman stated that it would develop pertinent information on coal, oil and other plant operating problems, including personnel, for distribution to the industry through the A. G. A. MONTHLY or other media. He advised that activities of the Subcommittees on Carbonization and Coke and on Water Gas would be confined to problems developed in small organizations.

In connection with the work on Water Gas, it was stated that H. M. Blain, of New Orleans, had accepted the chairmanship of a Subcommittee on High B.t.u. Gas which would cooperate with the Natural Gas Section committee.

Operation of Motor Vehicles

Prior to holding a meeting at which ODT Order 21 and gasoline regulations were thoroughly dissected and analyzed from the public utility standpoint, Mr. Edsall reported that the Motor Vehicle Committee would devote much of its time this year to maintaining contact with the Office of Defense Transportation and the Office of Price Administration. In this way, he stated, this group would keep in close touch with orders controlling the movement of vehicles and tires, and would endeavor to supply information of value to the Association's member companies.

Chemical

Mr. Robey reported that the chemists were struggling with a major problem—the shortage of manpower—and were also faced with the need for shortening tests in gas operations. He spoke of the employment of female personnel in laboratories, with good results in specified jobs for which they had been trained, and indicated that the committee would study the manpower question thoroughly. Publication of the revised Gas Chemist's Handbook will be pushed, he said, as many companies vitally needed such information.

Gas Conditioning

The ever-present problems of vapor phase gum (reduction in small gas flows), organic sulphur, and dust are being tackled with increasing vigor. Mr. Lehman stated in reporting on his committee's program. The A. G. A. Testing Laboratories in Cleveland are doing research work to make effective requirements calling for protec-

tive devices on all pilots of gas appliances and tests are now under way after a delay caused by their inability to produce gum for the tests. The Gas Conditioning Committee is reviewing suggestions which will be made available to assist the Laboratories in their work.

Mr. Lehman further reported that work on determining methods for detecting compounds making up organic sulphur is proceeding at the Institute of Gas Technology and results would be forthcoming in a few months. Pointing out that two pilot plants are now, or would shortly be in operation to develop information on this subject, Mr. Lehman attributed this work on the part of the manufacturer members to the committee's efforts. The whole subject of organic sulphur research from the Association's viewpoint will be covered in an article by Dr. Guernsey, chairman of the Organic Sulphur Subcommittee in an early issue of the A. G. A. MONTHLY.

The last problem of the committee, the dust problem, has not been active recently but this study will get under way shortly under the able leadership of Guy Corfield, of Los Angeles, who has accepted the chairmanship of the permanent subcommittee.

Distribution

A tentative limitation order reducing the tin content in solder used for meter repair work has received the extensive consideration of the Distribution Committee, Mr. Andersen stated, and recommendations have been prepared concerning it for submission to the Tin Branch of WPB. The Subcommittee on Meters and Metering, J. H. Collins, chairman, will continue to devote its efforts to conservation of vital war materials and the study on bacterial corrosion under the direction of Dr. R. F. Hadley is proceeding satisfactorily, Mr. Andersen said. He also referred briefly to the work of the different groups on Cast Iron Pipe Standards, C. C. Jones, chairman; Construction and Maintenance, T. H. Kendall, chairman, and Work on Consumers' Premises, W. T. Collins, chairman.

Mixed Gas Research

The proposed mixed gas research, which will be conducted jointly by the Natural Gas and Technical Sections, was outlined by Mr. Turner. This study will be made at the A. G. A. Testing Laboratories under the direction of a joint committee consisting of three natural gas and three technical members.



Meeting to organize the Technical Section for a crucial war year were these gas industry leaders. Left to right: Major Alexander Forward, managing director, A. G. A.; W. Cullen Morris, National Technological Civil Protection Committee, New York; and Harold L. Gaidry, New Orleans, chairman of the Technical Section.

TECHNICIANS AT WORK



Forming the Association's technical program for 1943—left to right: Arthur F. Bridge, Los Angeles, president, American Gas Association; Harold L. Gaidry, New Orleans, chairman, Technical Section; and Charles F. Turner, Cleveland, vice-chairman, Technical Section.



Gas industry operating and research experts. Left to right: Dr. E. W. Guernsey, Baltimore, vice-chairman, Gas Conditioning Committee, and chairman, Organic Sulphur Subcommittee; T. L. Robey, Washington, chairman, Chemical Committee; and V. J. Altieri, Everett, vice-chairman, Chemical Committee



Left to right: H. G. Horstman, Indianapolis; E. W. Zimmerman, Everett, chairman, Gas Production Committee; C. H. Waring, Kansas City; R. H. Whipple, Philadelphia; J. V. Postles, Philadelphia,



Left to right: A. C. Cherry, Cincinnati, vice-chairman, Distribution Committee; H. B. Andersen, Philadelphia, chairman, Distribution Committee; Dr. C. W. Wilson, Baltimore, chairman, Subcommittee on Analyses and Tests; and Dr. Frank Dotterweich, Natural Gas-Natural Gasoline Div., Petroleum Administration for War.



Left to right: R. F. Hadley, Philadelphia, Beal Medal winner for Androebic Corrosion research; A. V. Smith, Philadelphia; F. M. Goodwin, Newton Centre, Mass., past chairman, Technical Section, and F. C. Weber, Glen Head, N. Y., member, Advisory Committee.



Some of the Motor Vehicles Committee in action—left to right, seated: K. Fuery, A. G. A., New York; Linn Edsall, Philadelphia, chairman, Motor Vehicles Committee; E. W. Jahn, Baltimore, vice-chairman, Motor Vehicles Committee. Standing: Jean Y. Ray, Richmond, past chairman, Motor Vehicles Committee; H. A. Petersen, New York; C. Nicols, Baltimore, Md.; S. G. Page, Pittsburgh; and B. D. Connor, Boston.

past chairman, Technical Section; R. E. Kruger, Rochester, 1942 Beal Medal winner; E. M. Bliss, Harrison, N. J.; K. Wight, and Dr. R. L. Starkey, New Brunswick, N. J., Corrosion Research.

"Nitric Oxide" Control



Louis Shnidman

IT IS important that the operating and distribution engineer have available as part of his regular operation simple and direct methods for determining the nature of any deposits that may form in his system and likewise the measures for their control. This is especially true during

these trying times when we are engaged in a war when conditions of maximum production with reduced personnel are encountered. The control of the nitric oxide content of fuel gases is one aspect of the larger problem of the control of deposits from fuel gases.

"Nitric Oxide" in this paper is used as a general term to designate the compound or compounds in fuel gases which upon analysis are reported as nitric oxide, but which may or not be nitric oxide. "Nitric Oxide" represents one or more of the constituents that may give rise to deposit troubles, mostly in the form of the so-called vapor phase gum, as distinguished from liquid phase gum mainly due to the presence of indene and styrene. What follows is a brief outline of the studies that have been conducted by the Rochester Gas & Electric Corporation for the past several years.

Nature of Deposits from Fuel Gases

The first step in the control of deposits and likewise nitric oxide in fuel gases is to determine the nature, extent, and amount of such deposits that may form from the particular fuel gas. In the past groups of Rutz lighter installations have been used to collect the deposits on the gas adjusting needle points. The amount of material collected on the needle point is small, ranging around 0.00001 grams (0.00000022 pounds). This makes its identification and analysis difficult.

Shively¹ in his paper on "Determination of the Causes of Pilot Outages" outlined a multiple orifice for securing larger quantities of suspensoids present in fuel gases. We have built and have used for several years four of these multiple orifice testers located at selected points of the distribution system. This apparatus by causing the gas to impinge upon a glass plate at high velocity collects suspensoids that exist in the gas. The apparatus answered the general purpose, but because of its size, difficulty of installation and cumbersome operation, its usefulness was somewhat limited. An apparatus based upon a similar principle, but smaller, simpler, more convenient, and more readily adaptable for plant control

By LOUIS SHNIDMAN

Rochester Gas & Electric Corp.
Rochester, N. Y.

purposes would have greater application. The apparatus known as the deposit tester, shown in Figure 1, was developed as a result.

This consists of a one-inch pipe containing an inner $\frac{1}{8}$ " tube so arranged that the gas through five Drill No. 73 MSD orifices impinges upon a microscope glass slide. A small Electrolux refrigerator regulator is placed ahead of the apparatus, and when operating at 6", it passes approximately 12 cu.ft. of manufactured gas per hour. A slot holds the glass slide in position at a distance of $\frac{1}{16}$ " from the orifices. This tester in addition to being small is of simple design, compact, and easy to install, and its operation can be made to yield quantitative results; i.e., the glass slide can be weighed before and after a given volume of gas has been passed.

This apparatus has been used for either short time or long time tests. The deposit slide tester has been installed in various parts of the plant; for example, at the outlet of the light oil scrubbers, inlet to our holders, outlet of our holders, in the low and high pressure gas as it leaves the plant at selected points in the distribution system, as well as on some consumer premises. At first the glass slides were changed daily, later as more data were collected they were changed weekly, and now every two months.

This deposit tester offers a simple and convenient way of collecting the suspensoids that may exist in a fuel gas. Enough material is collected so that subsequent analysis and identification can be made. In general the deposits that are collected may be of an oily nature, of a resinous character, or a mixture of both. When trouble is encountered, the oily nature of the deposit

disappears and the resinous portion becomes dry and assumes a powdery appearance. Sometimes there may be a change in the color of the deposit. A visual or microscopic examination is made relative to the behavior of the deposit towards various organic solvents and chemical reagents. A brief outline of additional methods of analysis are given by Shively,¹ Sheridan,² Bayer,³ and Fuel-Flue Gases.⁴ Wilson⁵ has also described a method for determining the quantity of suspended material in gas.

Having obtained some knowledge of the type of suspensoids and deposits that may arise from his fuel gas, the engineer is then in a position to ascertain whether further studies and controls are necessary. As the next step it may be desirable to run tests on the fuel gas for nitric oxide at various locations in the plant.

Nitric Oxide Determination

A number of methods for the determination of nitric oxide in fuel gases are available at present; viz., those developed by Fulweiler,⁶ Shaw,⁶ and Hollings.⁷ All of these methods require special apparatus and equipment, are rather involved in their procedure, and in some cases are applicable only to a given type of gas. It appeared desirable to have available a simple and direct method for determination of nitric oxide which could be used on any type of gas; i.e., whether it be coke oven gas, coal gas, blue gas, carburetted blue gas, mixtures of the above, or other special gases. The author in conjunction with J. S. Yeaw⁸ developed a simple and direct method for the determination of nitric oxide in fuel gases.

In brief this method for the analysis of a fuel gas for nitric oxide consists in passing the gas through three simplified absorbers, the first filled with sodium hydroxide, the second with acid potassium permanganate, and the third with Greiss-Ilosvay reagent (sulfanilic acid + alpha naphthylamine in acetic acid). Any hydrogen sulfide or related interfering compounds will be removed by the sodium hydroxide. The per-

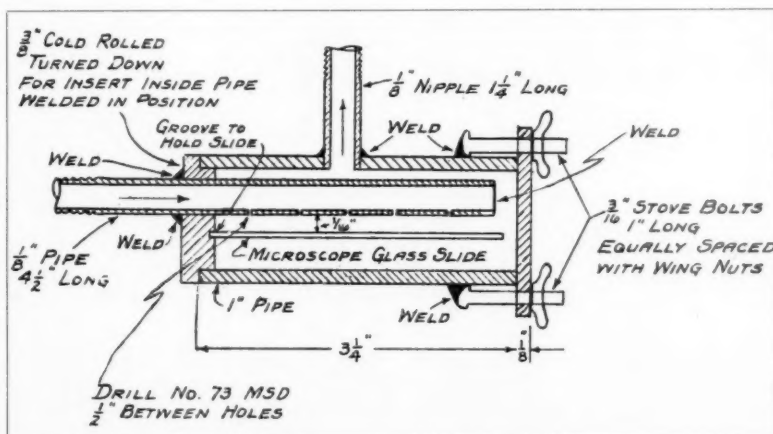


Figure 1—Deposit tester

Presented at A. G. A. Annual Meeting, Technical Section, October 5-6, 1942.

manganate solution oxidizes nitric oxide in the gas to nitrogen peroxide and the nitrogen peroxide formed reacts with the Greiss-Ilosvay reagent in the third tube to form a characteristic red dye. The depth of the color in the third or Greiss-Ilosvay reagent absorber is proportional to the nitric oxide content of the gas. The intensity produced is used as a measure of the amount of nitric oxide in the fuel gas by comparison with previously prepared standards. This method for the determination of nitric oxide in fuel gas is simple, direct, and avoids many of the disadvantages of the older methods.

Having this direct method for nitric oxide available, its determination in the fuel gas at the various stages in its production is simplified. The operating engineer would be interested in ascertaining the concentration of nitric oxide at various points in this particular plant. In the case of the coke oven plant similar to that operated at Rochester, the nitric oxide in the gas as it leaves the coke ovens is of the order of one part per million. No change in nitric oxide concentration takes place in the purifying of the gas until the oxide boxes for hydrogen sulfide removal are reached. There around 80 per cent of the nitric oxide is removed. The holders remove around 80 per cent of the remaining nitric oxide such that the gas going to the city contains less than .05 parts per million.

Other gases encountered in gas manufacture may contain nitric oxide of widely different concentrations. The flue gas at the coke ovens has between 70 and 80 parts per million of nitric oxide. Producer gas contains less than one part per million of nitric oxide. The nitric oxide concentration of blue gas or carburetted blue gas depends upon the type of operation and particular machine in use. At the present time we are engaged in a study of the distribution of nitric oxide in the plant where we manufacture both coke oven gas and water gas. The details and results of these studies will no doubt be made available at a later date. The above results give a general picture of what can be expected.

It appears that the source of nitric oxide is from combustion products that find their way into the fuel gas. Attempts to control nitric oxide at the source therefore resolves itself into eliminating combustion products. In the case of coke oven gas maintaining a proper pressure at the ovens to avoid entrance of flue products will aid in reducing nitric oxide in the gas. In the case of blue gas and water gas, control can result by limiting or reducing to a minimum blast gases or other types of combustion gas that contain relatively high nitric oxide concentrations from entering the fuel gas. Using the simplified quantitative method for nitric oxide analysis⁸ its concentration can be determined readily in the various gases at the plant. The operator is then in a position to control intelligently nitric oxide by eliminating contamination at the source as far as is practical.

TABLE I
Nitric Oxide Evolution Tests of Revivified Samples of Oxide Sponge

Sponge Lot. No.	Times Used Previously	Test Results	
		Nitric Oxide p.p.m.	Nitric Oxide Fouled
1940	new	.46	11
1941	new	.30	8
30	2	.44	11
32	2	.22	6
33	2	.49	12
36	2	.25	6
29	3	.42	11
31	3	.44	11
42	1	.30	7
Completely fouled		4.00	100

Oxide Conditioning

It has been indicated previously that some 80 per cent of the nitric oxide in coke oven gas is removed by the iron oxide used in hydrogen sulfide removal. This being the case it is important that the oxide be maintained in such a condition that it will continue to remove nitric oxide and at no time liberate it. From our studies on the removal of nitric oxide by oxide sponge at the plant, it was observed that the usual fouling test with respect to hydrogen sulfide does not necessarily indicate corresponding conditions with respect to nitric oxide. Although the oxide may have been conditioned and revivified with respect to its hydrogen sulfide removing ability, it may not have been completely conditioned with respect to nitric oxide.

This experience indicated the desirability of having some test for the oxide with regard to its nitric oxide behavior. Experience has shown that oxide sponge which had absorbed nitric oxide will liberate it if conditions are right. Exposing the sponge in an atmosphere where the vapor pressure of nitric oxide is less than that where the sponge was first exposed, helped in its liberation. A simple test was developed based on this behavior which would indicate the relative fouling of the oxide with respect to nitric oxide. This method consists in determining the amount of nitric oxide liberated from a given sample of oxide.

A 50 cc. sample (30 grams) of oxide is placed in a 1 1/4" by 3" glass tube which in turn is immersed in a bath of boiling water. A stream of purified city gas of known nitric oxide content is passed through the sample at the rate of 20 liters or .71 cu.ft. per hour. This gas was then passed to a regular nitric oxide analyzer (see method by Shnidman and Yeaw⁹). The test was continued for 15 minutes or until 5 liters of gas had passed. The concentration of nitric oxide shown by the analysis of this outlet gas is taken as a measure of the relative ease with which the foul or revivified sponge would remove nitric oxide. The results were also taken to be an inverse measure of the relative revivification of the sponge with respect to nitric oxide.

Employing this procedure, foul oxide sponges used once, twice, or three times

show nitric oxide evolution of from 3 parts per million to 5 parts per million. It may be interesting to indicate the behavior of a foul sponge standing in the yard of the plant. One particular sample of foul sponge showed a nitric oxide liberation of 5 parts per million. After six days having been moved twice, it showed a nitric oxide liberation of 3.4 parts per million. After 37 days lying in the pile, the liberation was 1.3 parts per million. After 46 days lying in the pile the nitric oxide liberated was .6 parts per million. After 81 days, the nitric oxide liberated was .5 parts per million. Other batches of foul oxide behaved in somewhat similar manner.

Table I shows the results of nitric oxide evolution tests in revivified samples of oxide sponge. These results indicate that new oxide which has never been in service shows around 10 per cent nitric oxide fouling. There may be various reasons for this occurrence; viz., contamination of the oxide by foul oxide in immediate vicinity or due to the nature of the oxide itself. It is also shown that the fouled sponge may be revivified with regard to nitric oxide so that it will liberate no greater amount than will fresh oxide. In other words, it can be reduced to the value of around 10 per cent nitric oxide fouling.

We have used this test as a means of determining when the foul sponge has been properly revivified with regard to nitric oxide conditioning before it is returned into plant service. To date more than ten batches of oxide have been reconditioned and reduced to the above minimum and put back into service. No noticeable increase in nitric oxide in the gas resulted from the use of this reconditioned oxide.

During our studies with regard to oxide conditioning and nitric oxide removal, it was noticed that if the oxide was turned over frequently so as to dissipate the heat generated and at the same time accelerate its revivification with respect to hydrogen sulfide removal, it showed high nitric oxide liberation by the test outlined above. On the other hand, when the oxide had been left standing so that it has an opportunity to heat up, it tended to give lower nitric oxide liberation results. This later procedure although not satisfactory for hydrogen sulfide revivification is more desirable with regard to nitric oxide conditioning. Laboratory tests showed that nitric oxide was completely removed from a fouled sponge in less than 15 hours in a drying oven at 200°F. By the use of the above described tests the operator has at his disposal a means whereby he can control nitric oxide removal in his plant by properly reconditioning the foul oxide with regard to nitric oxide liberation.

It was mentioned previously that the holders reduced the nitric oxide content around 80 per cent. In view of this it is important that such reaction which occurs in the holder be permitted to take place. Even in the case of emergency the operating engineer should consider carefully the advisability of bypassing the holder which should

not be done unless he has knowledge as to the nature of his gas with regard to its nitric oxide content and the type and nature of the suspensoids that may be deposited from it, as observed in the above described deposit slide tester. If the nitric oxide concentration is less than .05 parts per million and a minimum of suspensoids are obtained, then it would be advisable to consider bypassing the holder. If these conditions are not met, bypassing the holder can be expected to result in a marked increase in service calls.

Other measures for the prevention or control of "Nitric Oxide" are reported in the literature.⁹ In some cases these measures have proven effective while in other cases they were of a limited or temporary value. The practice of spraying water or steam into mains and sometime steam into the holder has a limited effect, and this method of control is not recommended except as a temporary expedient to be used only during an epidemic of stoppages. Reducing the oxygen content of the gas to a minimum is partially helpful. The use of oil scrubbing as a control is questionable. The removal of nitric oxide by iron sulfide in the oxide boxes has been helpful, but at the expense of hydrogen sulfide removal. The removal of nitric oxide by electric precipitation has proven successful, but requires additional equipment and operating expense. The installation of filters on pilot lines of appliances has been adopted by some companies. The use of filters is still an open question, some maintaining that if the gas is properly prepared, their use is unnecessary.

Pilot Tests

The installation of groups of pilots like Rutz lighters, usually four in a common manifold at the plant and at various points in the distribution system, are of value in keeping a further control on the trend of possible deposit troubles. Before installation the pilot including the adjusting screw and its housing should be carefully cleaned. When installed the height of the pilot flame should be set to a common and predetermined standard. A record of their burning time and any outages that may occur is kept. In cases where serious deposit troubles are encountered, such groups of Rutz lighters at the plant will go out within less than four hours.

The value of installing groups of lighters at the plant is that they give an immediate indication of the nature of the gas that is being distributed as it leaves the plant. If any deposit troubles are to be encountered, they will manifest themselves first at the plant set-up. Consider, for example, the case where the groups of Rutz lighters installed at the plant, after burning with no apparent change for some time, suddenly go out. This would be evidence that some change has occurred in plant operation which has altered the nature of the gas. In such a case a test for the nitric oxide content of the gas should be made, and it will indicate whether nitric oxide is a factor. These lighters, in addition to giving information with regard to changes in the plant

and type of gas distributed, will also indicate when remedial measures are applied whether any beneficial response may be expected in advance of data obtained from the general service calls.

In our laboratory, in addition to groups of Rutz lighters, we also set up banks of 12 storage water heater pilots. We have found that these give some additional information that corroborates the findings of the Rutz lights. It is felt that in the case of Rutz lighters a minimum of 20 lighters should be installed at the plant so that small changes or variations will not influence the behavior of the lighters.

Service Calls

In any attempt to control the "Nitric Oxide" content or deposits from fuel gas, the analysis of the daily service calls are important. If the analysis is detailed enough, it will bring out facts that are otherwise not apparent. We in Rochester have given this matter considerable thought, and as a result have developed the following scheme for analyzing our service calls.

Total Daily Service Requests

This day
Week ago
Year ago

Total Daily Pilots Serviced

This day
Week ago
Year ago

Water Heaters, according to make, itemized

Stoppage at { Adjusting Screw
Pilot Tip
Tips

Ranges

Stoppage at { Adjusting Screw
Tips

Electrolux

Location of stoppage
Minimum flame

Commercial Equipment—Ranges, Coffee Makers, etc.

Stoppage at { Adjusting Screw
Tips
Other Locations

In this analysis the laboratory keeps in constant touch with the service department and receives each day their report indicating the total service requests received and that particular day in turn is compared with those received a week ago and a year ago on the same day. Likewise, the total pilots serviced for the particular day is received which in turn is compared with those serviced a week ago and a year ago. The pilots serviced are further analyzed with respect to the type of equipment like water heaters, ranges, Electroluxes, and commercial equipment.

In the case of water heaters each make is itemized like Penfield, Ruud, tank or side-arm heaters, etc. For each make the location of the stoppage or trouble is indicated; i.e., whether it has occurred at the gas adjusting screw, at the pilot orifice in the gas to the burner pilot, or at the pilot tip. In the case of ranges the report shows whether the stoppage is at the gas adjusting screw or at the pilot tip. In the case of Electrolux the analysis includes minimum flames as well as other sources of trouble.

Commercial equipment is also included in this analysis wherein ranges, coffee makers, deep fat friers and the like are considered, each being itemized separately indicating whether the location of the trouble is at the gas adjusting screw, at the pilot tip, or any other special location. With such a complete analysis of the total service requests as well as the pilots serviced daily, the engineer is in a position to follow any trends as to when trouble may arise. These data when correlated with the results of the pilot tests, nitric oxide tests, and other plant tests, afford indication of the behavior of the gas with respect to deposit troubles.

Summary

It can be seen from a study of the previous discussion that "Nitric Oxide" control involves not only the consideration of nitric oxide, but a number of other factors which may be more or less important depending upon the condition and the type of fuel gas produced. The engineer has available tools that enable him to control intelligently the "Nitric Oxide" if and when it is encountered. These different tools have been considered above and briefly consist of the following:

(1) Information and data on the nature of suspensoids and deposits that may be characteristic of the particular fuel gas may be collected. This can be facilitated by the use of the deposit tester shown in Fig. 1. Data of either a qualitative or quantitative nature can be obtained.

(2) Before "Nitric Oxide" can be controlled, a simple and direct method for its determination in the fuel gas at various stages in its production must be available. Such a simple method was developed and is described completely in the paper, entitled, "The Quantitative Determination of Nitric Oxide in Manufactured Gases."⁸ Having such a method available, data can be collected relative to the nitric oxide content of the fuel gas at various points in the plant. When such data have been secured, proper consideration can be given to eliminate or reduce to a minimum the nitric oxide content of the gas, by limiting the entrance of flue gases or combustion gases (which are high in nitric oxide) into the fuel gas. Proper operation of coke ovens or water gas machines will help in this direction.

(3) Correct conditioning of iron oxide used in hydrogen sulfide removal is important since this material removes a greater part of the nitric oxide present in the gas. A simple test was described above by means of which it is possible to determine when the oxide has been properly revived with regard to its nitric oxide behavior. All oxides before use should be tested to make certain that they have reached minimum values with regard to nitric oxide liberation. It has also been indicated that certain reactions take place in the holders and bypassing such holders should not be considered unless adequate information is available. Other measures for the control of nitric oxide as reported in the literature⁹ are indicated in brief.

(4) The installation of groups of pilots like Rutz lighters at the plant and at various points in the distribution system is of value in keeping a further control on the trend of possible deposit troubles.

(5) A complete and detailed analysis of the daily service calls and requests, as well as pilots serviced will indicate the type of equipment that is giving the greatest trouble, where such troubles are confined, and whether there is a marked rise in pilot calls. This information correlated with the data obtained by the other tools will indicate the behavior of the gas with respect to deposit troubles.

By proper consideration of the above factors or tools, the engineer is in a position to intelligently control not only the "Nitric Oxide" content of fuel gas, but also reduce to a minimum possible troubles from deposits that may occur in the equipment and appliances on his fuel gas service.

The author wishes to express his appreciation for the help and assistance received from J. Frank Thompson and Jesse S. Yeaw of the Laboratory Staff during the course of this study.

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METAL TREATING AND MELTING

(Continued from page 35)

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SERVING ON ALL FRONTS

(Continued from page 37)

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Oklahoma Natural Gas Co., Tulsa, Okla.

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Portland Gas & Coke Co., Portland, Oregon

WAR CONTRIBUTIONS OF NATURAL GAS

(Continued from page 12)

del Rey reservoir, located close to the center of the gas distribution system of the Los Angeles Basin area, has been taken over by the Defense Plant Corporation and will be operated as a gas storage reservoir to be used primarily as a source of supply to meet emergency peak load conditions. Geological studies of the structure indicate that the capacity of the field will be approximately 3 billion cubic feet. Of this, one billion cubic feet will be allowed to remain in the formation as a pressure back-log and 2 billion cubic feet will be available for current storage. Three miles of 12-inch pipe has been laid from the Southern California Gas Company's 26-inch main line. This line has already been connected to the injection wells and gas is being injected in small amounts at line pressure of approximately 160 pounds pending the installation of a compressor plant.

Among the major developments of District Five during the past year are:

1. The conversion of the Stanpac line from a gas line to an oil pipe line and the subsequent rearrangement and addition of natural gas facilities to handle additional gas from the Rio Vista gas field to the San Francisco area.
2. The general increase in crude oil production and particularly the shifting to more low gravity crude at low gas oil ratios to get greater

fuel oil yields. This program necessitated some changes in gasoline plant facilities and gas handling facilities.

3. The increased demand for isobutane was met by full cooperation of gasoline plant operators in increasing their plant efficiencies and providing facilities for maximum recovery of isobutane. Our last report indicates about 97% of isobutane is being delivered to manufacturers of 100-octane.
4. To conserve all gas production, a Gas Conservation Committee, under the direction of the Production Committee, and assisted by the Natural Gas and Natural Gasoline Committee, has produced most excellent results. The investigation made every operator conscious of the problem, and by voluntary cooperation, practically all of the existing situations have been or will shortly be corrected.
5. Through the cooperation of the Production Committee, with the Natural Gas and Natural Gasoline Committee, the production of natural gas is being regulated to meet the gas demands. The fact that only two fuels are generally available in California; namely, fuel oil and natural gas, presents an immediate problem due to the need for accumulating maximum stocks of fuel oil for war purposes. This requires that the maximum fuel need of industry in the district be met with natural gas and requires the maximum production of casinghead gas to meet the requirements in Southern California.

Conservation is the biggest word in the supply phase of the war effort. Likewise when we talk about the conservation of oil and gas we are talking about the life span of the oil and gas industry. When we deal with it we are dealing with the industrial future of the nation and with the health, comfort and future of our citizens.

Conservation of natural gas reserves and conservation in the production, transmission, and utilization of natural gas must be faced positively by all of us. Sound policies must be encouraged and sound laws and their proper enforcement be sincerely advocated. The

importance of proper utilization of gas produced with oil, calls for continued support of studies designed to permit the proper use, in an orderly manner, of the gas produced with oil, which heretofore has been blown in the air and wasted.

The war emergency will cause many dislocations in our operations but on the credit side, dire necessity will teach us much about better production methods, better transportation and distribution methods, better ways and means not only of conserving the product but of preventing the economic dissipation of it.

This war is the first thing before the house. Victory in it will strain our resources, require our best talents and utilize the maximum of our energies. Its prosecution requires the utmost conservation of critical materials, which in our industry means largely metals and particularly steel. This being true, I should like to emphasize that in our considerations in the Natural Gas and Natural Gasoline Division, we are proceeding on the theory that the most effective promotion of the war program demands the minimum expenditure of critical materials consistent with proper and adequate development of gas reserves and resources required, and only as required, for such program.

Our recommendations will be made after cautious study with a view to determining whether or not additional gas is needed for the immediate future, or on an overall development program designed to drill a specific number of wells necessary to meet required deliverability. We feel that this policy may be expected to contribute to the most effective promotion of the war program.

We Get Blamed for This

BILL KOCH, fitter for Gas Service Company at Parsons, Kansas, recently made a service call in which he needed a gas mask.

The call came from the Dienst Apartment where the occupants thought the conversion burner had gone out and that gas was escaping through the entire house.

On his arrival, he found all the windows and doors wide open but the odor wasn't gas. On investigating he found a dead cat lying on top of the furnace and with the help of Bob Bogges, they removed it, leaving behind some very appreciative customers.

Personnel Service

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Engineer—26 years with engineering organization managing and operating utilities. Thoroughly familiar both natural and artificial gas. Broad training in rates, valuation, reports, surveys, property records, etc. B.S. degree in engineering. Available immediately for permanent connection. 1450.

Manager, college degree, with more than twenty years' experience in management of manufactured gas properties, both coal and water gas. Familiar with operation in Spanish country. Location immaterial. 1452.

Technical administrative position desired. M.E., married, two children, III-B military classification. Experience: gas manufacture and distribution; sales and service of commercial and industrial installations using manufactured, natural, and liquefied gas; supervised research in industrial gas and all phases of petroleum (39). 1453.

Registered Professional Engineer, 20 years' experience oil and gas, U. S. and abroad, expert Spanish, draft-exempt, available as consultant, manager, engineer, geologist. 1454.

Position wanted as gas engineer or as manager of gas operations. Engineering graduate with 20 years' experience as industrial gas salesman, superintendent of distribution and gas engineer. Draft status 3A. Available on reasonable notice. 1455.

Wanted—position as local gas company manager. My experience has brought me in contact with all the duties of the general and local office; street main—service meters—sales and service. Confidential classification Record on file at A. G. A. Headquarters. 1456.

Twenty-five years' experience as an operator and executive with utility companies handling natural gas, oil gas manufacturing and liquefied petroleum gases covering all phases of operation, production, transmission and distribution. Technical education, married with family and excellent health. Will locate any place in job of responsibility. A-1 references. 1457.

POSITIONS OPEN

Foreman in water gas plant of 10,000 M daily capacity to supervise operation and maintenance. State age, experience salary expected and give references. 0371.

Research Engineer for investigation of new methods of gas manufacture. Experience in gas industry desirable but research training and ability of paramount importance. Give full details with military status in letter. Enclose photograph. 0372.

RATE MEN NEEDED

Robert A. Nixon, director of the Transportation and Utilities Division of OPA, wrote for the NARUC Bulletin of Dec. 4:

"Our Public Utilities Branch has vacancies for technically trained people with salary ranging from \$2600 to \$5600 per year. The positions available include those of lawyers who might appear before regulatory commissions in connection with rate increase proceedings. We also need a limited number of persons with experience in the handling of financial, accounting, or engineering aspects of utility rate problems. Applications should be directed either to me or to Harry A. Booth, Chief of the Public Utilities Branch."

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